HISTORY OF THE

1ST STRATEGIC AEROSPACE DIVISION

and

VANDENBERG AIR FORCE BASE

1957 - 1961

by

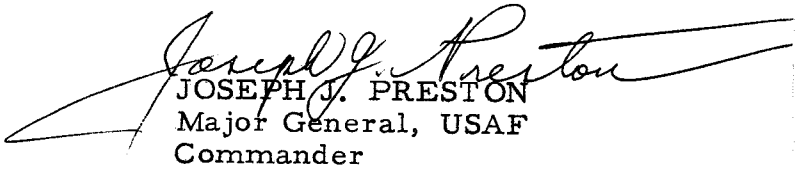
Carl Berger and Warren S. Howard

April 1962

STRATEGIC AIR COMMAND

FOREWORD

Five years ago, on April 15, 1957, the 1st Missile Division was created to pioneer the incorporation of long-range missiles into the Air Force's arsenal of deterrents to aggression. Nearly one hundred missiles and satellites have since been launched from Vandenberg Air Force Base in the past three years. The 1st Missile Division was renamed the "1st Strategic Aerospace Division" in recognition of the pioneering efforts at Vandenberg and other bases in the field of ballistic missiles. The Air Force today has attained the capability of operating into far reaches of aerospace. The following pages describe the massive effort which has accompanied these vital events.



JOSEPH J. PRESTON
Major General, USAF
Commander

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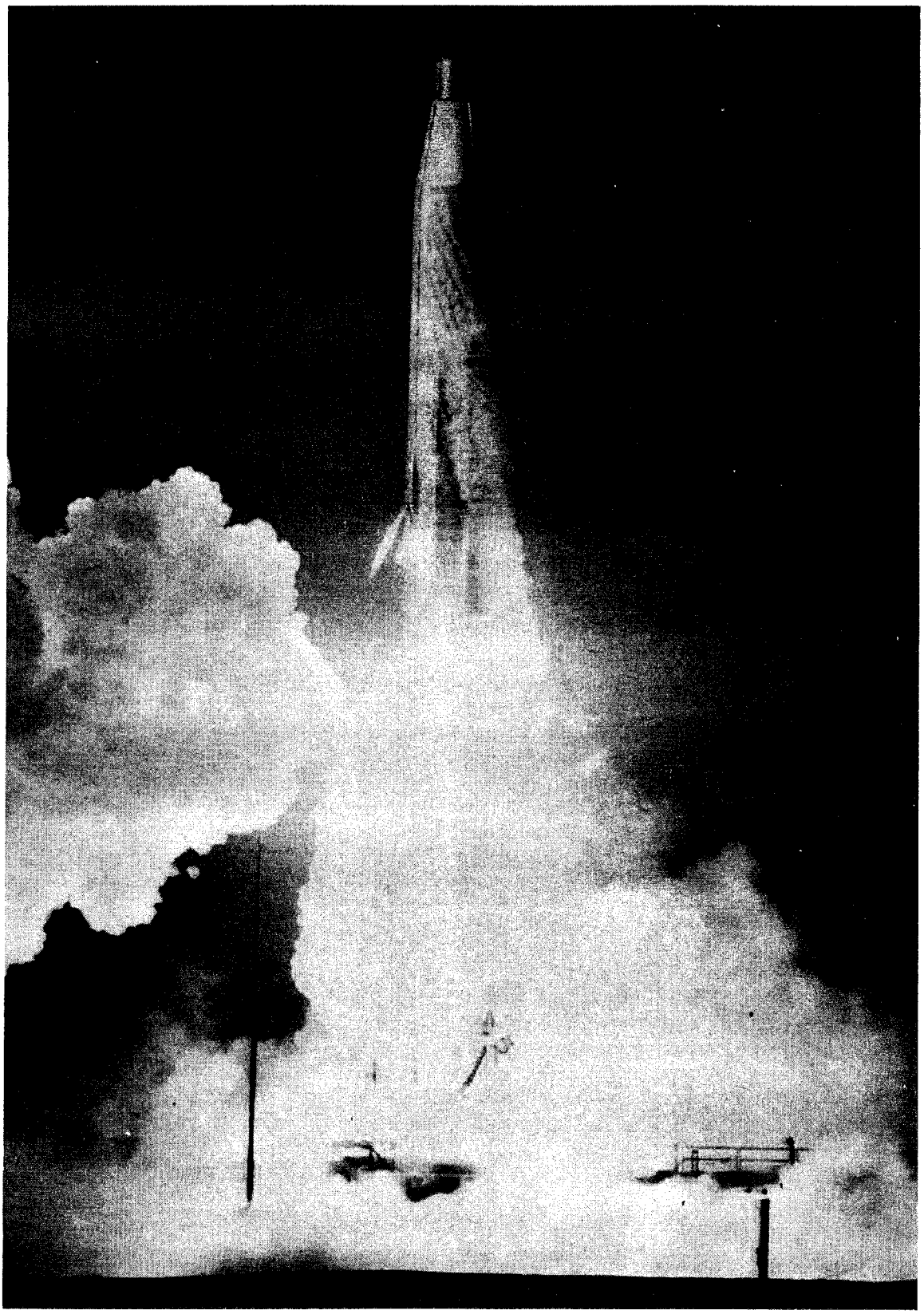
AUTHOR'S NOTE

This history is a revision and continuation of the History of the 1st Missile Division, prepared early in 1960 by Mr. Carl Berger, the command's able historian. Over one thousand copies of that history were distributed to the public. The present publication recounts the important events which have occurred here during the last two years. It has also been possible to enlarge the account of the base's earlier operations.

Many people have made this publication possible. The support of Major General David Wade and Major General Joseph J. Preston, Division commanders, was paramount in its creation. S/Sgt. Ray A. Hanner of the Historical Division brought the 1960 edition's chronology up to date, and Mrs. Catherine Fuller transformed a semi-legible manuscript into the attractive pages which follow. In a broader sense, acknowledgments are due to the many people who have worked in Vandenberg AFB's information services, and particularly to Major Derrill deS. Trenholm, Director of Information. In the broadest sense, this history must acknowledge the tens of thousands of men and women whose combined efforts have produced the events which these pages reflect.

Warren S. Howard
Acting Command Historian

Vandenberg Air Force Base
January 3, 1962



An ATLAS thunders aloft from Vandenberg Air Force Base

CHAPTER I

Creating A Missile Division

During the mid-1930's western Santa Barbara County was a quiet agricultural and mining area. Lompoc and Santa Maria were country towns of 3,000 and 7,000, famed for their flower fields. Between them lay Burton Mesa, a dry and windswept plateau whose shale bedrock was indented by deep gullies and pockets of sand, clay, and gravel. Cattle and sheep grazing on the sparse vegetation shared the mesa with gophers and sea birds and mule deer. The night fogs which persistently shrouded Burton Mesa's flat landscape typified the quietness which apparently would always surround this corner of California.

But out of the holocaust of the Nazi movement in Germany emerged factors that would transform the mesa and its nearby communities. A quarter-century later Burton Mesa was the site of world-famous Air Force missile installations of such size that they pushed into the Casmalia Hills northeast of the mesa and extended across the Santa Inez Valley into the hills of Point Arguello on the south. Nearly 20,000 men were building facilities, testing missiles, launching earth satellites, training combat-ready crews for other bases, and standing ready--if need be--to fire back in anger against an aggressor. The 1st Strategic Aerospace Division, a unique military organization, supervised this activity. How this vast base was created is the subject of this history.

World War II and the Mesa

The peacefulness of western Santa Barbara County was shattered as German armies swept across western Europe and the Luftwaffe unleashed its blitzkrieg against Britain. America began to arm, and training camps were

hurried into existence. In 1941 the War Department purchased Burton Mesa and most of Point Arguello. The new base was named Camp Cooke in honor of a Civil War general. Workmen began to construct a sprawling complex of barracks and supporting structures. Before Camp Cooke was finished America was plunged into a shooting war. The mesa began to resound to the sounds of marching troops and rumbling tanks. As many as 36,000 American soldiers were stationed simultaneously at Cooke while they were welded into tough fighting units. Three armored divisions, two infantry regiments, and a variety of smaller organizations were trained during the war years.

Camp Cooke was one of the factors from which Vandenberg Air Force Base evolved; another was the V-2, a German military rocket. On the evening of September 8, 1944, two of the V-2's smashed into London to mark the start of a terrifying offensive. The V-2, capable of placing 2000-pound bombs upon targets as distant as 250 miles, was truly a terrifying weapon. Its destruction by Allied air attack before launching was enormously difficult because the caravan of trucks and trailers which transported the missile and its support equipment could be moved into firing position and dispersed again within a few hours. Once airborne, V-2 was invulnerable. As it plunged toward its target after reaching a height of 55 miles, it reached speeds of 3500 miles an hour. The best fighter aircraft and antiaircraft guns were helpless against it, and no warning could be given to persons in its path.

Fortunately for the Allies, the V-2 had serious shortcomings. Engine and guidance failures were so common that over one-fourth of the V-2's fired towards England fell near their launchers or into the North Sea. The missile was notoriously inaccurate, and the bomb spread destruction over only a

small radius. Nonetheless, no fewer than 2,724 Britons were killed and 6,467 injured by V-2's, and heavy damage was inflicted on Antwerp and other continental targets by another barrage of missiles. Only Germany's collapse ended the fearful bombardment.

As the war ended, Americans and Russians hastened to secure V-2 experts, plants, and rockets. Since Peenemunde, the German rocket experimental station, was in eastern Germany, the Russians obtained the bulk of the men and equipment, as well as blueprints for a two-stage rocket designed to hit the east coast of the United States. But several top German rocket experts, including Dr. Wernher von Braun and Major General Walter Dornberger, fled westward and surrendered themselves and their knowledge to the Americans. The United States Army seized the underground V-2 factory in the Harz Mountains and cleaned it out in the summer of 1945, shipping tons of V-2 components to the United States. Soon after the war American scientists began to fire V-2's from the White Sands proving grounds into the lower fringes of space, to study the conditions existing above the earth's atmosphere.

But little urgency was felt. Most Americans believed that another war was remote. They demanded strict economy in defense projects. There were sound technical reasons why ballistic missiles fared badly in the competition for appropriation dollars. Though early atomic weapons spread their destruction over the awesome radius of two miles, scientists were uncertain that a missile could be <u>reliably</u> guided within that distance of its target after a flight of thousands of miles. Since long-ranged missiles would have to develop almost fantastic speeds, no one could be certain that rocket

engines of sufficient power could be developed--or that the missile's bomb-carrying "reentry vehicle" could survive the intense heat created as it plunged into the atmosphere at speeds of 15,000 miles an hour.

A far surer deterrent to aggression lay in the United States' powerful fleet of long-ranged bombers. And so the early American program to develop intercontinental ballistic missiles was limited. In 1946 the Air Force began to subsidize a research program by the Convair Aircraft Corporation, but the funds were cut off the following year. American missile development concentrated on space probes using the V-2's, and on short-range battlefield weapons.

The ICBM Program Revives

During 1950 new scientific studies indicated that giant rocket engines could be developed, and the Convair project was revived on a small scale. In 1952 came a key event in the intercontinental ballistic missile program --the detonation of the first hydrogen bomb. The H-bomb's vast destructive radius made unnecessary extreme accuracy in its dropping, and thus swept away the greatest technical obstacle to an effective long-ranged missile. During the summer of 1953 a panel of experts concluded that H-bombs small enough to be carried aboard missiles would be in existence near the end of the decade. In 1954 the Air Force's Strategic Missiles Evaluation Committee, composed of leading scientists and engineers, recommended that the United States "redirect, expand, and accelerate" the development of intercontinental missiles. The Department of Defense accepted its findings, and Convair was ordered to proceed at full speed with development of its long-ranged missile.

Soon the Martin company started development of another intercontinental missile as a backstop for Convair's program, and the Douglas Aircraft Corporation began designing an "intermediate" range (1500 mile) missile. The Air Force's Air Research and Development Command created its Western Development Division (later renamed Air Force Ballistic Missile Division), with headquarters at Inglewood, California, to supervise the development effort. AFBMD geared itself for high-speed operations by using the bold concept of "concurrency." Instead of developing a missile one step at a time, all of the elements which went into its "weapon system" would be created simultaneously. Work on the rocket engines and guidance system would begin even before the bomb they were to propel had been perfected, and large-scale construction of missile bases and training of combat crews would precede the first test flights. There was a certain amount of risk inherent in the concept of "concurrency"—but the risks were far less grave than the alternative risk of stretching a missile's development over many years. The nation's defense could not wait upon conventional methods.

One of AFBMD's key requirements was a base where missiles and their supporting ground equipment could be tested under the conditions existing at operational bases in the field. This pioneering base could also train combat crews for the field bases, and its launchers would be the first to stand ready against aggressors. The Air Force test facilities at Cape Canaveral, Florida, were not designed to support such activities. And so in January 1956 the Air Force began to canvass nearly two hundred government-owned tracts of land, in a search for the site of America's first combat-ready missile base.

Camp Cooke Changes Mission

At this time Camp Cooke was merely another inactive army post. Closed down at the end of World War II, it had been reopened during the Korean war and once again inactivated. Sheep grazed amid its 2000 slowly-deteriorating wooden buildings. Despite its shabby appearance, Camp Cooke stood out from the other sites for several reasons. Since it was large and remote, it could easily accommodate many missile launchers built at safe distances both from civilian communities and the base's "cantonment" or living area. Many men could be fed and housed in existing structures, and the base was well supplied with warehouses, railroad spurs, and other supporting facilities. Since Camp Cooke fronted on the Pacific, missiles could be launched over the ocean without danger to inhabited areas. The base was conveniently near AFBMD's headquarters and missile manufacturers in Los Angeles and San Diego. By the fall of 1956 the Air Force had made its decision, and after approval by the Secretary of Defense AFBMD acquired all of Camp Cooke lying north of the Santa Inez River--some 64,000 acres. The land south of the river was given to the Navy as a test center for naval missiles.

In March 1957 the 1st Bombardment Division, inactive since World War II, was brought back to life. Cited for the heroism of its crews during the Eighth Air Force's strategic bombing offensive against Germany, the division now would make history in a different manner as it was renamed the 1st Missile Division, and assigned to AFBMD. Colonel William A. Sheppard was made division commander, and given orders to train combat crews, give support to test launches, and maintain combat readiness with the long-ranged missiles assigned to his squadrons. To operate Cooke Air Force Base, the 392d Air Base Group, a

World War II unit which had supported troop carrier training in North Carolina, was reactivated and assigned to his command as the base's housekeeping organization.

Under original plans, the Division would command not only the missile squadrons which would be created at Cooke AFB, but also those at widely scattered bases in the field. To assist the Division's staff in managing this far-flung organization, the 704th Strategic Missile Wing was created. The 704th chose as its motto the words "Leadership--Knowledge--Dynamic Application", and operated effectively for nearly two years until missile squadrons in the field were turned over to the Strategic Air Command's regional air forces. The Division never was within the chain of command that controlled the initial phase of Air Force weapon system testing at Cooke AFB; this "Category II" test program was at first controlled by an AFBMD field office, and later by AFBMD's 6565th Test Wing. But the Division was closely connected with Cat II tests because of the logistical support which it gave to the test crews.

Colonel Sheppard was well aware that he was embarking on a unique assignment. He wrote to one of his officers, "We are in the formative stage of missile methodology...No pattern has been established." His division was to be the pattern maker.

SAC Enters the Picture

Before the Division was nine months old, it had changed commanders and parent command. The Union of Soviet Socialist Republics was also establishing patterns. On August 27, 1957, the Soviet government reported that it had launched "a super long-distance intercontinental multi-stage ballistic missile" which had flown "at a very high, unprecedented altitude". This

feat would "make it possible to reach remote areas without resorting to a strategic air force".

Eloquent proof of Russia's ability to build powerful missiles came on October 4, 1957, when the earth's first artificial satellite was hurled into space. The American people became acutely conscious of missiles as they watched the bright new star race through the dusk above their cities. Their concern was heightened on November 3, when Soviet scientists fired into orbit an 1120-pound satellite carrying a live dog. The military implications of these feats caused an immediate acceleration of the Air Force's missile program. As part of this acceleration, the 1st Missile Division was transferred from the Air Research and Development Command to the command which would be the ultimate user of ballistic missiles. On November 29 General Thomas D. White, Air Force Chief of Staff, ordered the commander of the Strategic Air Command, General Thomas S. Power, to take over the responsibility for attaining the Air Force's initial ability to operate ballistic missiles.

To succeed Colonel Sheppard as commander of the 1st Missile Division, General Power selected his Chief of Staff, Major General David Wade. In a letter of instructions, the SAC commander described the Division's transfer as "an opportunity for a combined Air Force effort for the early incorporation of ballistic missiles into the operational inventory." And so SAC took over the mushrooming installations at Cooke Air Force Base, becoming a builder of missile facilities in close cooperation with AFBMD, the Air Materiel Command, and the Army's Corps of Engineers.

CHAPTER II

Building A Missile Base

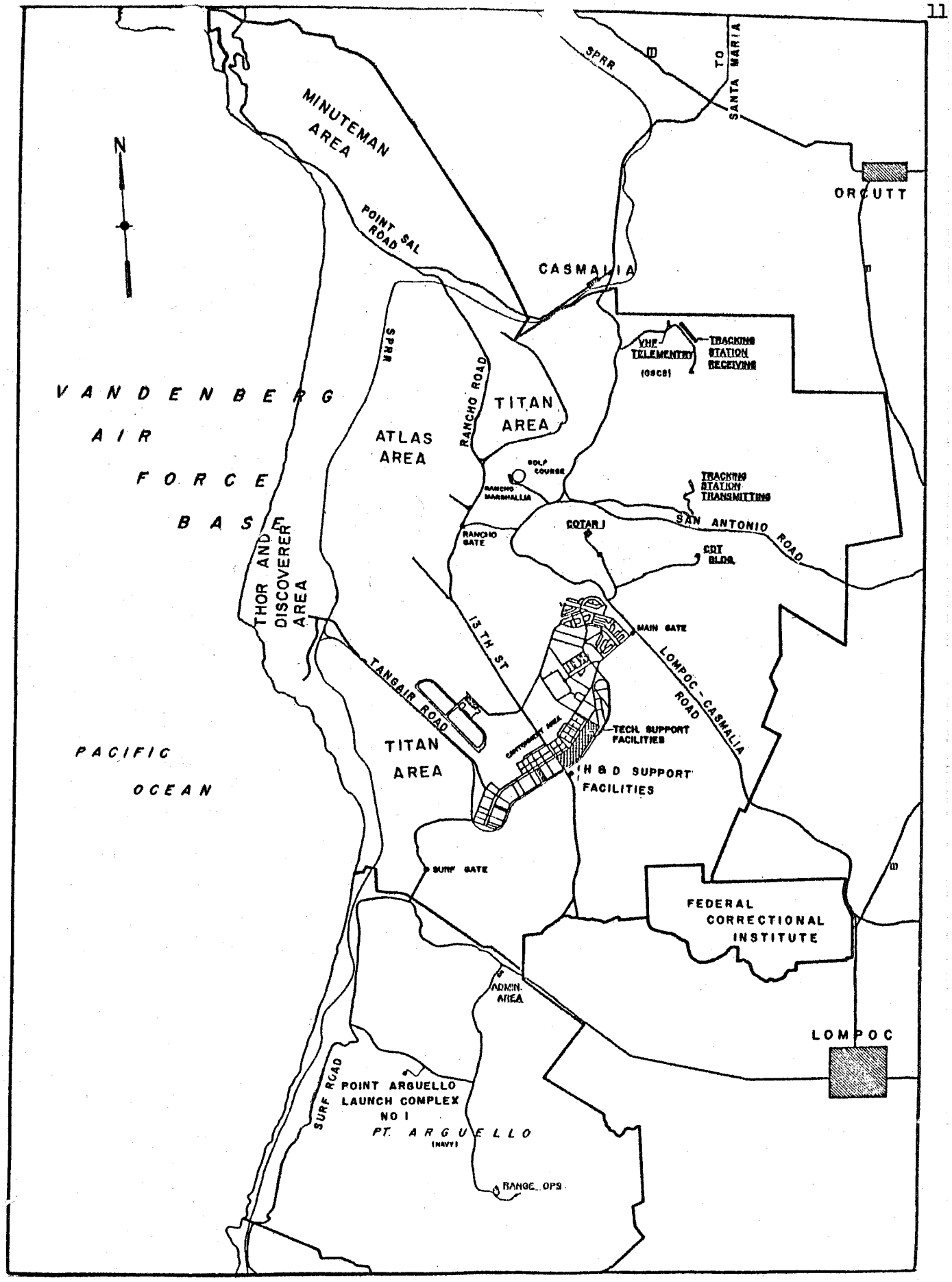
Cooke Air Force base, lying silent and deserted, had been a depressing sight when the division cadre arrived to begin the enormous task of building a missile base. The off-yellow paint was peeling from the old barracks, and weeds and brush sprouted thickly around them. The roads--mostly gravel and dirt trails--were broken in places, or so covered with growth that it was difficult to distinguish them from the fields. Weeds were spreading onto the airfield runway. The water treatment plant was in disrepair, telephone lines were broken, and usable living quarters scarcely existed.

On May 9, 1957 a small group of newsmen and local dignitaries gathered in the shade of a eucalyptus windbreak to witness ground-breaking ceremonies presided over by AFBMD's Major General Osmond J. Ritland. General Ritland sketched the vast activity that would follow as barracks, mess halls, chapels, the airfield, and other support facilities were repaired and modernized, and vast new missile facilities constructed. He predicted that Vandenberg's basic construction would cost "roughly in the vicinity of $100,000,000," a figure which the expanding missile program had already doubled by the beginning of 1960.

The early days at Cooke were hectic. The mess halls were so dilapidated that airmen ate at the Army prison adjacent to the base. Propeller-driven aircraft assigned to the Division for transportation and proficiency flying had to be based at the Santa Maria airport, while the T-33 jet trainers flew out of Oxnard Air Force Base, 125 miles away. Clouds of dust were swirled over the base by the persistent ocean winds. Traffic was frequently snarled by excavations and paving operations.

The Army had built only eight homes at Camp Cooke, for the base had been designed as a mobilization center where troops trained together for a few months before shipping overseas. Men sent to Camp Cooke left their families behind--an unbearable situation at a missile base whose men normally served tours of two or three years. Construction of government-owned "Capehart" homes was a high-priority project. In July 1957 contractors began moving or demolishing the old wooden buildings in the cantonment's northwestern corner, and on October 23 the ground-breaking for the first Capehart home was held. Gradually long rows of modern ranch-style homes took shape on streets pleasantly named for trees.

Unfortunately the Capehart project did not eliminate the critical housing situation. According to public law, the homes could be rented only to officers and NCO's, and there were not enough "Capeharts" to satisfy the needs even of these groups. Married airmen of lower ranks, as well as civilian contractors and civil service personnel, were completely excluded from on-base family housing. Here the isolation which made Cooke an ideal missile base created a severe problem. Lompoc and Santa Maria, the only towns within convenient commuting distance, were still small. Their available rentals were soon saturated, and rents rose rapidly as the competition for housing increased. Private builders were reluctant to invest vast sums in housing for a base which they feared might be inactivated within a few years. Although a large amount of construction was undertaken (in 1958-59 building permits were taken out for 4,434 housing units, or over half again as many as had been built the preceding twelve years), the base population's steady increase tended to cancel out the gains. The housing situation was particularly acute for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MINUTEMAN AREA
POINT SAL ROAD
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VANDENBERG AIR FORCE BASE
SPRR
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ATLAS AREA
TITAN AREA
VHF TELEMENTRY (OSCS)
TRACKING STATION RECEIVING
GOLF COURSE
RANCHO MARSHALLIA
TRACKING STATION TRANSMITTING
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13 TH ST
MAIN GATE
LOMPOC - CASMALIA ROAD
TANGAIR ROAD
TECH. SUPPORT FACILITIES
H & D SUPPORT FACILITIES
TITAN AREA
PACIFIC OCEAN
SURF GATE
FEDERAL CORRECTIONAL INSTITUTE
ADMIN. AREA
LOMPOC
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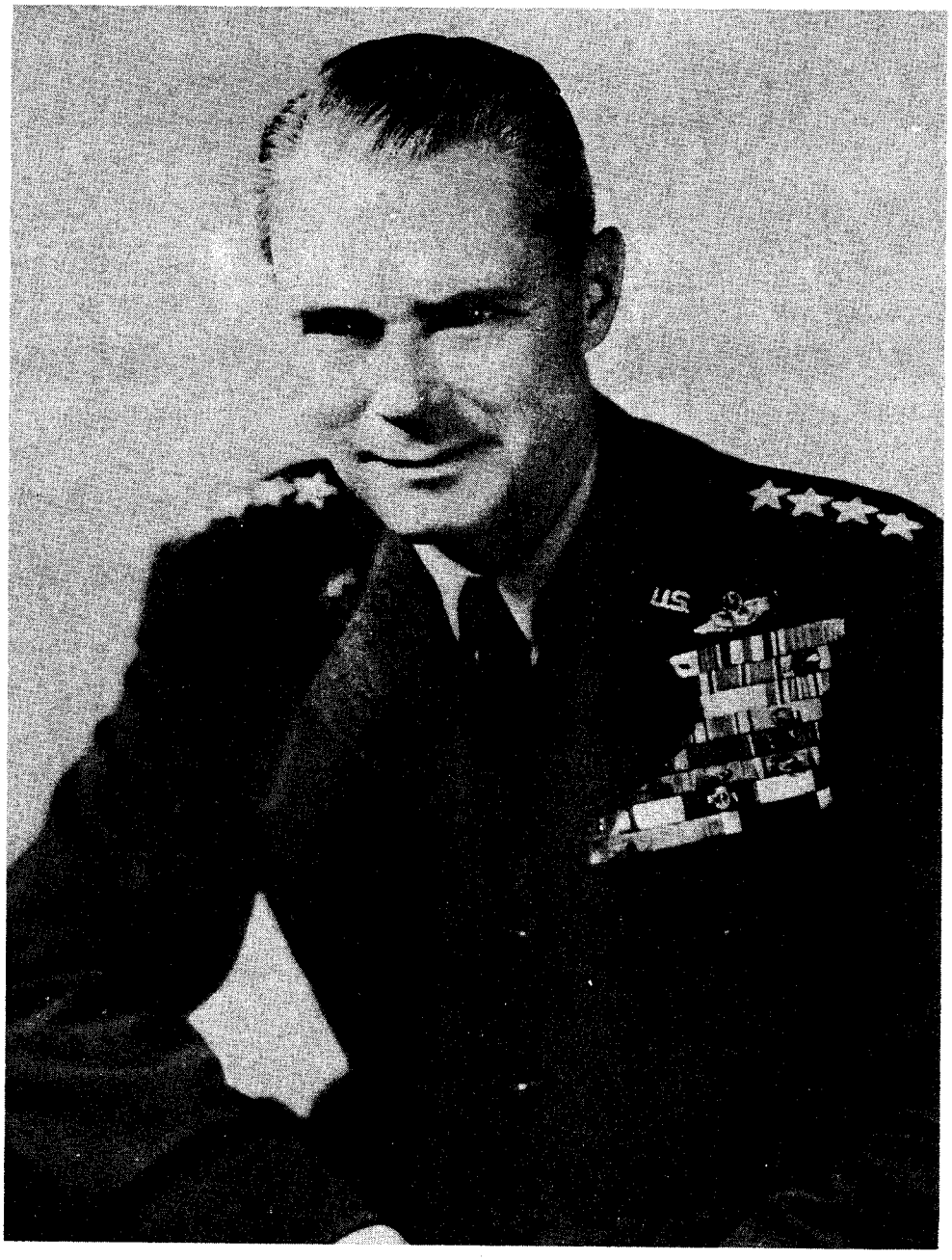
RANGE OPS



General Hoyt S. Vandenberg, Chief of Staff
of the United States Air Force 1948-1953

lower-ranking airmen with families. Some were forced to live in substandard housing, while others began to commute from such distant communities as Santa Barbara, Pismo Beach, and San Luis Obispo.

Still, by the early fall of 1958 much progress had been made towards making Cooke a liveable base. Some $4 millions spent on labor and materials (the nails alone used to renovate one group of 100 buildings would have filled forty pickup trucks) had produced impressive results. The barracks were now attractively painted green and white, and their austere open bays had been broken into double rooms with built-in wardrobes. Large fields of grass and ice plant reduced the dust. A remodeled base exchange and the first rebuilt dining hall had been opened, utilities were functioning smoothly, service clubs were active. Over 600 Capeharts were occupied, and family life came to Cooke Air Force Base. Children at play became a familiar sight, and hundreds of youngsters trooped into classes held in old hospital buildings which had been remodeled into an elementary school. A nursery and youth center were opened, a Boy Scout troop was becoming active, a hundred Little League footballers were playing. Womens' clubs were active, athletes were competing with teams from other bases, and the base had undoubtedly become a real home to many of the people stationed there.

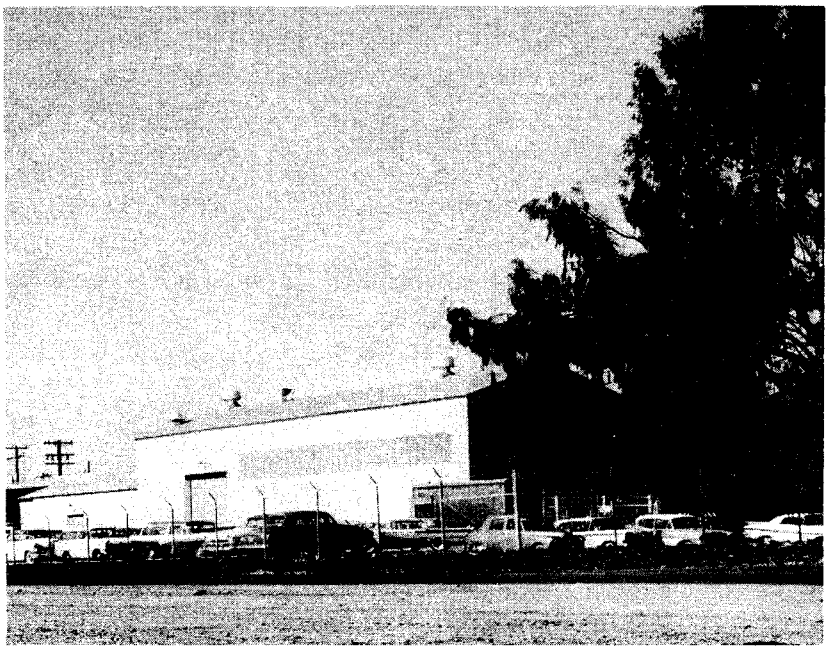
Meanwhile plans to rename the base in honor of General Hoyt S. Vandenberg, second Chief of Staff of the Air Force, were completed. Since his death in 1954, the Air Force had been waiting for the opening of a base sufficiently important to be worthy of his name. Mrs. Vandenberg and their son, daughter-in-law, and grandson were guests of honor at formal dedication ceremonies held on October 5, 1958. General Wade spoke of the proud tradition which the base was inheriting:

> "Here, the Air Force missileman will take his place beside the bomber crew and the fighter pilot who stand ready to retaliate against any aggression. In time to come, the missile badge he wears will become as well known as today's pilot wings, and Vandenberg Air Force Base will be known as the home of that new breed of airmen--the Missilemen...It will be a continuing challenge...to live up to the responsibilities inherent in the new name of our base...The renaming of this base is more than a ceremony...it is the assumption of a proud and priceless heritage and the beginning of a tradition..."

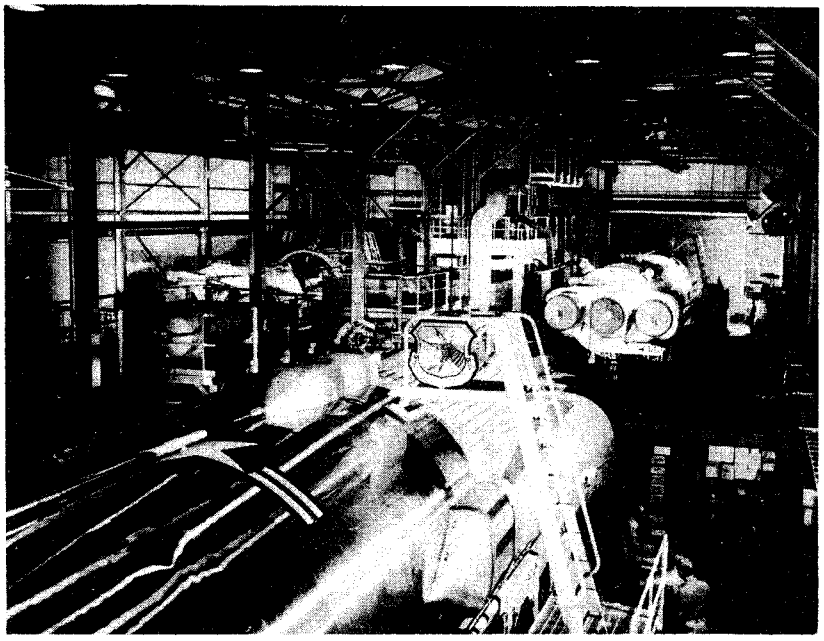
* * *

Yet Vandenberg Air Force Base had not yet fired a missile. Between the cantonment and the Pacific, sprawling launch facilities were taking shape--the missile launchers themselves, fuel storage tanks, power houses, blast-proof control blockhouses, a radio guidance station. Between Nevada and New Mexico Avenues along the cantonment's southeasterly side, great sheet-metal covered missile assembly and maintenance buildings (variously known as RIMS, MABS, SMAMS and MAMS) had arisen. These missile-age hangars contained large open bays in which entire missiles could be accommodated, and smaller shops for work on particular parts; overhead bridge cranes allowed technicians to easily move heavy parts from one area to another. Near the hangars were new liquid oxygen generating plants, whose powerful compressors would create the intensely cold bluish fluid that is injected into missile combustion chambers to make fuel burn more fiercely. Southwest of the cantonment was the closely guarded compound which would house the base's stockpile of missile reentry vehicles.

On a hillside north of the cantonment was the vital new instrumentation and safety center operated by the 704th Instrumentation Squadron. One of its buildings was the telemetering station, whose recording graphs would trace out each missile's heartbeat--measured in terms of velocities



Vandenberg's original ATLAS missile assembly and maintenance building



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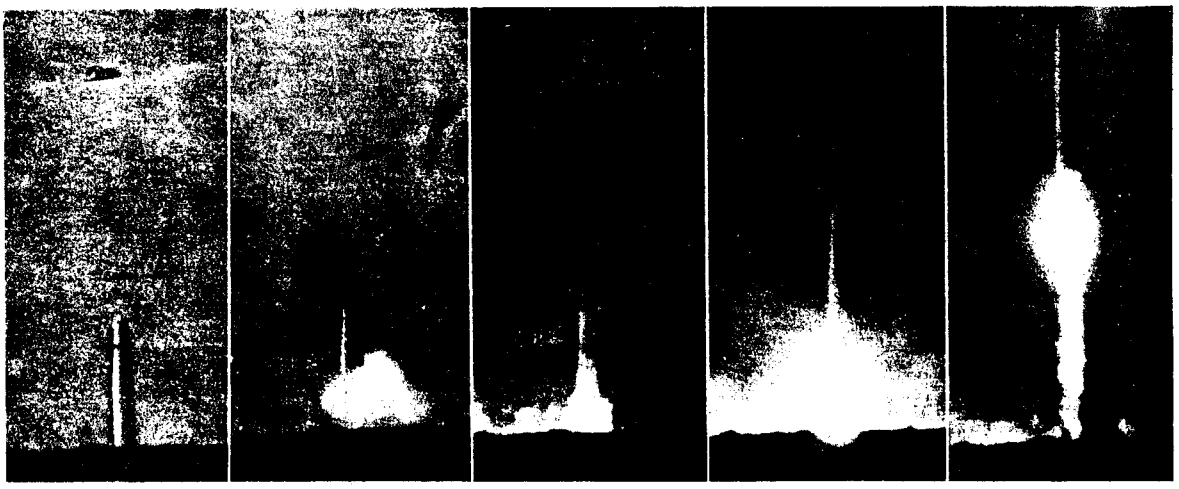
LAUNCH THOR MISSILE FROM NEW CAL. BASE

Big Thor Missile Blasts Off to Open West Coast Base



WEST COAST DEBUT—This long-range sequence shows the Thor ballistic missile, the first ever fired by a combat crew blasting off in its West Coast debut to inaugurate the new Vandenberg Air Force Base

PACIFIC MISSILE SOARS

First Fired By AF Crew

By RALPH DIGHTON

VANDENBERG AIR FORCE BASE (AP)—An Air Force crew lobbed a combat-type Thor missile 1,500 miles westward over the Pacific missile range yesterday.

The deadly white dart rose slowly from its launching pad at this Strategic Air Command base, then gathered speed swiftly. Three minutes later it was out of sight and racing toward its target area at speeds approaching 10,000 mph.

The roar of its takeoff was heard for miles around.

"Let's go, you baby girl!" an Air Force officer shouted prayerfully as the medium range ballistic started on its journey.

THE SUCCESS of the shot was strong ammunition for America's campaign to secure missile bases overseas. Thor bases have been set up in the British Isles and negotiations are under way for bases in other countries.

Russia has warned its smaller neighbors it would regard as an unfriendly act any decision to allow the United States to set up missile bases close to the Iron Curtain. The newest demonstration of America's missile readiness is expected to influence some of the reluctant nations.

THE 65-FOOT high Thor was fired by the same type of crew that would launch it in the field under combat conditions.

It was the first launching at this new Air Force missile base and the free world's first firing of a ballistic under push button warfare circumstances. The 11-man crew fired the missile at 3:43 p.m., only 11 minutes after starting to fill it with fuel.

The weapon can carry a nuclear warhead, but did not yesterday.

The weather was sunny and warm and with only a slight breeze. But coastal fog was starting to roll in as the bird took wing.

THE MISSILE was in sight for a little over three minutes before fading from sight. A mighty shout arose from nearly 200 crewmen watching from about 1½ miles away, as the white needle rose vertically, then nosed over toward the west.

The shot was delayed 3¼ hours by unexplained technical difficulties.

The firing was from one of eight Thor launching pads on the edge of the blue Pacific.

America's Allies, some already armed with Thors — known as intermediate range ballistic missiles — have waited for weeks to see how the big birds perform in the hands of regular Air Force crews.

THE 11-MAN crew headed by a seasoned combat pilot, Capt. John C. Ben Tempo of Aliquippa, Pa., conducted the firing.

It was the first of many practice shots of various kinds of weapons at this 64,000-acre base. This first one was little more than a test of new launching and tracking facilities.

But soon the Air Force will be firing the larger intercontinental missiles. And within only a few weeks it may attempt to hurl from this base a 1,200-pound satellite into orbit around the earth's poles. Other satellite shots may follow, perhaps as often as once a month.

A6 Los Angeles Herald & Express SC Wednesday, Dec. 17, 1958

Thors Fly 1500 Miles Over Sea

U. S. Shows Missile Punch Over Atlantic and Pacific

By FORD CLEERE

Herald-Express Staff Reporter

VANDENBERG AIR FORCE BASE, Dec. 17—In an awesome display of two-ocean punch, America has rocketed two Thor missiles 1500 miles over the Atlantic and Pacific oceans, landing five miles from the target point.

One of the 65-foot-long **Douglas Thors powered by a Rocketdyne engine roared off a launching pad at 3:43 p. m. yesterday here marking the successful entry of this base into the Missile Age.**

"The missiles went right down the pickle barrel," said a spokesman.

Both the Vandenberg and the Cape Canaveral-launched Thors were labelled complete successes this paving the way for the first Project Discoverer program before the end of the year.

The Thor leaped skyward here yesterday at 10,000 miles per hour in the first official launching at this base and the first by an all-Air Force crew.

Neither the air force nor the navy will make any attempt to recover the prize—the nose cone of the medium range Thor.

Major Gen. David Wade commander of the First Missile Division, said the shot was a great success, despite a 1-hour 28-minute delay in the final half hour of the countdown. The delay was necessitated mainly by minor technical adjustments, he said, but several minutes were lost while three trains went through the base.

"We will try to plan our shots around train schedules," he said, "but we don't always know just when a freight train will roll through."

and pressures--as radioed back by its transmitters during flight. The center also contained radar sets and telescopes to track the missile's path, and the "command destruct transmitter." This radio's signal could explode a safety charge within a straying missile, and by rupturing its fuel tanks bring its flight to a swift, fiery--and safe--conclusion.

The Division established other safety precautions. Missilemen were equipped with sturdy plastic helmets, nonsparking shoes, heavy gloves, showers (to wash off dangerous chemicals), and most important with strict instructions on how to protect themselves. Wide danger zones were thrown around hazardous missile operations. Since the Southern Pacific railroad's main line passed through these areas as it hugged its way along the coast, close coordination was established to insure that no missile would be fired while a train was passing through a danger zone. As a final touch, fire and ambulance crews were trained to deal with any eventuality.

The THOR Complex

On August 13, 1958, the first operational missile was delivered to the base--a 65 foot THOR intermediate range weapon built by the Douglas Aircraft Corporation.

By this time contractors and AFBMD specialists were beginning the demonstration tests which would determine if the equipment in the THOR launch complex was fully operational. A missile launch would climax these demonstrations. Normally this launch would have been carried out by AFBMD personnel; but General Wade, anxious to hasten SAC's entry into the missile field, obtained permission for a Strategic Air Command crew to launch the first THOR from Vandenberg. A team from the 392d Missile Training Squadron (activated in September 1957 to conduct Vandenberg's THOR program) began training with contractor personnel.

And so the center of attention shifted away from Vandenberg's burgeoning cantonment to Launch Complex 75 on barren Purisima Point, the base's western tip. Nothing had been there except great windswept dunes bearing a thin cover of brush and grass. The Vinnell Company's construction manager recalled,

> "When we first arrived on that site, it seemed as if we were way out in the boondocks. When new workers reported in, we simply told them to head for the Pacific and keep going until they saw some activity. That would be so because we were the only ones out there."

The workers found that at times they had to wear goggles and work behind plywood barricades to protect themselves from stinging sand whirled into the air by strong ocean winds. Drifting sand sometimes covered fresh excavations before they could be used. The Army Engineers began spraying oil, and planting rye grass and ice plant which clung tenaciously to the dunes. At one point a snow fence was built to keep the sand under control. The complex gradually took shape, its most prominent feature a scattered group of long and narrow sheet-iron hangars. THOR normally lay on its side inside its hangar; when it was to be fired, the hangar was rolled back and the missile raised to a vertical position by a powerful erecting boom. Fueling and firing would be carried out by remote control from the complex's heavily-built blockhouse.

Operation "Tune Up"

On October 29, 1958, the 1st Missile Division published its first launch order—Operations Launch Order 301-75-58, unclassified nickname "Tune Up." The order's 71 pages detailed the elaborate operations which would occur as many men teamed to support the firing of THOR missile 151 into the Pacific Missile Range. As the launch date approached, the Navy,

which controlled the range, began to monitor the location of shipping. H-13 helicopters and U-3A liaison aircraft prepared to search the area, watching out particularly for Southern Pacific trains and work crews which might unexpectedly enter the hazard zone. Danger areas were posted, and measures taken to evacuate them when the launch countdown began. A battery of cameras was moved into position, and ambulance and fire truck crews alerted. The target setting was fed into THOR's autopilot. The missile's trajectory was carefully calculated, and the instrumentation squadron aimed its telescopes and radars to instantly detect any deviations from the planned flight path. The commander of the 704th Instrumentation Squadron prepared himself for the lonely task of deciding whether the missile needed to be destroyed.

Operation "Tune Up" was originally scheduled for December 5, but technical difficulties forced one postponement after another. Shortly after midnight on December 16 technicians once more began to check out the missile's working parts, and as day broke over the mesa an elaborate testing of the telemetry and command destruct systems got underway. Newsmen gathered around the site as it began to appear that this time the preparations were going to result in a launch. Morning passed into afternoon, and the tension began to increase as minor malfunctions and passing trains required repeated halts in the countdown. Capt. Bennie Castillo, 35-year old launch control officer, inserted a key into his console and started the terminal countdown. As the final minutes approached, a white cloud poured out of the missile as its liquid oxygen tank began to bleed excess pressure. At forty-five minutes past three powerful pumps hurled streams of kerosene and liquid oxygen into the THOR's combustion chamber, and the missile flamed and began lifting from the launch pad. It climbed slowly at first

but gained velocity, rising atop a dazzling reddish-orange flame while its roar spread across the mesa. Whirring motion picture cameras tilted upward as the missile climbed sharply over the Pacific, appearing now like a ball of fire. Within a minute it was out of sight, while its Rocketdyne engine accelerated it to a speed of 10,000 miles an hour. A few minutes later the reentry vehicle hissed through the atmosphere and plummeted into the Pacific west of Vandenberg. The test was over; Vandenberg had fired its first missile.

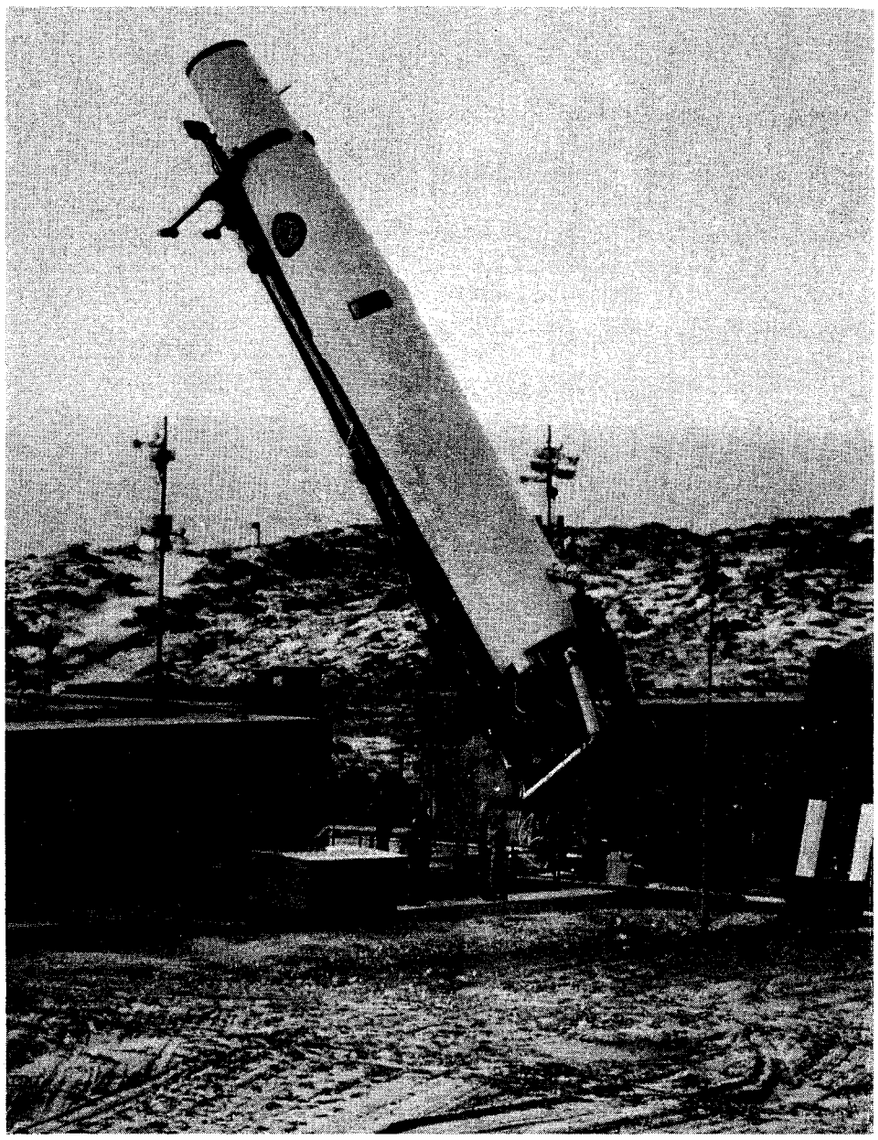
Operation "Tune Up" was more than the fiery baptism of a missile base. General Wade pointed out that this was also the first time that a Strategic Air Command crew had launched a ballistic missile; the first completely automatic launch of a fully operational ballistic missile; and the first occasion on which new launch equipment, a new missile, untried launch launch personnel, and a new organization had all been integrated into a successful operation. "Concurrency" had borne its first fruit.

CHAPTER III

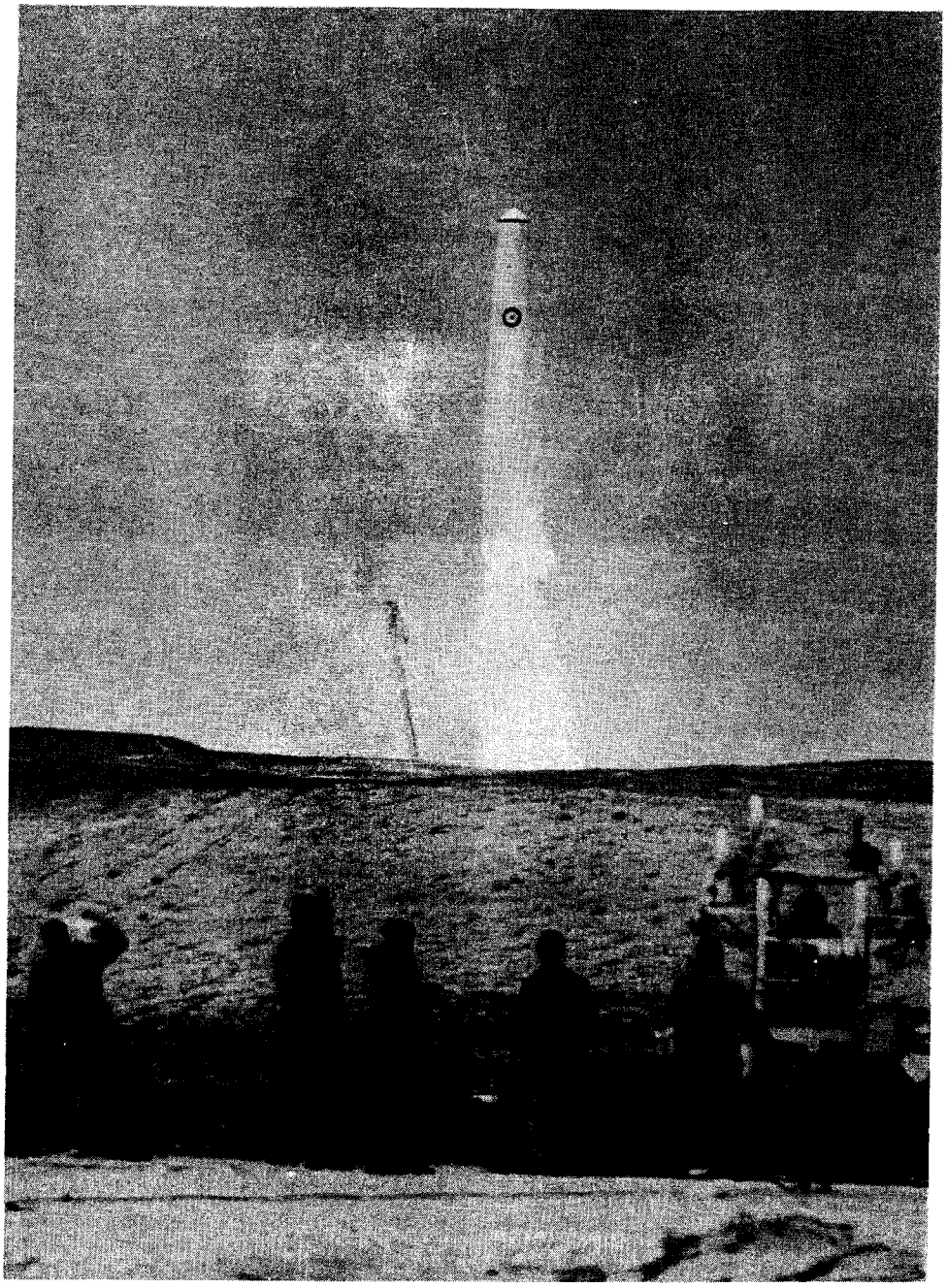
The RAF Comes to Vandenberg

In the months that followed "Tune Up", hundreds of British servicemen became intimately familiar with the contrast between the green fields and hills of eastern England and the barren mesa and dunes of Vandenberg AFB. For Vandenberg became the training center for Royal Air Force crews manning their nation's THOR missiles.

THOR had been developed specifically for deployment in NATO countries, including the United Kingdom. The United States would train and equip four RAF missile squadrons. The THORS would be under operational control of the British government, but each launch crew would include an American officer



RAF crewmen raise a THOR toward
firing position during checkout



Operation "Lion's Roar", the first THOR
launch by Royal Air Force missilemen

whose consent would be necessary before a missile could be fired "in anger." The THOR force would truly be a joint Anglo-American venture of the finest sort.

Construction of THOR launch facilities began in England during 1958, and simultaneously RAF airmen were sent for individual training to the plants of Douglas, Rocketdyne, and A. C. Spark Plug (maker of the IRBM's autopilot). Vandenberg's role would be to weld these individual missilemen into teams. THOR operations required plenty of teamwork. A launch crew included not only the two launch control officers, but also three console operators to monitor the instruments revealing the missile's condition, and three maintenance specialists who could pinpoint malfunctions. Each THOR squadron also would have teams of experts who would fuel and defuel missiles, and carry out more elaborate sorts of maintenance.

The first RAF students, men of the 77th and 97th Strategic Missile Squadrons, arrived at Vandenberg in August 1958. Because of an unexpected delay in completion of Complex 75, they had to spend most of their training time in classrooms and content themselves with "over-the-shoulder" observation of the missile facilities while American technicians labored at the installation and checkout of ground equipment. All difficulties, large and small, were gradually overcome. By February 1959 thirty-five launch crews (271 men), 173 maintenance men, 30 maintenance supervisors, and 14 staff officers from the two squadrons had each received 240 hours of training from the 392d's instructors and returned to England. During the same period 255 American servicemen also received training in THOR operations.

On March 2, 1959, turnover of the complex for training permitted the first "formal" or "hardware" IWST ("integrated weapon system training") class to open. This time men from the 98th and 144th RAF squadrons were involved. The outstanding event in their early training was the operation "Lion's Roar," the first THOR launch by RAF crewmen. Postponed for two days by bad weather and mechanical malfunctions, the launch was carried out successfully on April 16, 1959.

The THOR Proves Troublesome

The beginning of "hardware" training and the first THOR launches did not mean that the program had passed all its teething troubles. American and British crewmen encountered various difficulties. On April 9 a THOR was being static-fired when its engine exploded. The missile collapsed and burned, sending a spectacular smoke cloud over the complex and causing considerable damage to the launcher. No one was injured, thanks to the Division's rigid safety precautions. On April 23 a THOR was badly crumpled when its erecting boom continued to travel after raising it to a vertical position. This mishap was the more irritating because a similar accident had occurred on February 5. On June 16 an RAF-launched missile climbed obstinately straight up rather than spiraling out over the ocean. The autopilot had not started working as the missile left the ground because of a broken fitting on the launcher. At length the THOR was blown up, and its fragments showered into the sea and over the emplacement. Again there were no injuries. Additionally, the first two THOR launches and the first DISCOVERER launch (see Chapter VII) caused extensive damage to equipment exposed to the fiery engine blast.

These mishaps signified that THOR was still a very new weapon-- but by far the most significant fact about them is that they did not continue. Except for the mid-air breakup of a THOR launched on December 14, 1959, there were no additional losses of missiles. A "pad-toughening" program dramatically reduced fire damage by placing protective coverings around launcher equipment. A modification to the erecting equipment prevented further accidents during missile elevation. Missile malfunctions caused fewer and fewer delays, and the THOR training program fell into an unobtrusive but highly productive routine. One class after another went through its exercises, missiles were fired every few weeks, and by January 1960 the 392d MTS had trained 695 men from the 98th and 144th SMS's. Selected crews of the 77th and 97th Squadrons returned and launched missiles to prove that their improvised training had been effective. Early in December 1959 the British Secretary of State for Air revealed that THOR had become fully operational in Britain. Six weeks later the IWST program came to an end as the 144th SMS launched the eleventh RAF THOR.

The following day Vandenberg had a special graduation ceremony at which the British presented the 1st Missile Division a trophy of appreciation for the training which 1,250 British missilemen had received at Vandenberg. As he accepted the trophy, General Wade reviewed the significance of what the two services had jointly accomplished:

> "The training and operational procedures that have been developed, applied, and tested in this program have produced the free world's first operational system of ballistic missile bases. Much of the knowledge and experience gained in this undertaking will help us to accelerate the expansion of our intercontinental ballistic capability in the United States. Also of great importance is the tremendous increase of deterrent power which is now being supplied around the clock by the Vandenberg-trained Royal Air Force crews who are manning the operational THOR squadrons in the United Kingdom."

The CTL Program Continues

This did not end the Division's connection with the THOR program. Since THORS could not be fired from the British Isles in training exercises because there was no suitable target area, crews and missiles were sent to Vandenberg to fire practice shots into the empty wastes of the Pacific Missile Range. These "Combat Training Launches" (CTL) had a double purpose. Besides their value in training, they sustained the morale of British missilemen by letting them carry to completion the duties they had learned, and demonstrating that the missiles they carefully maintained were in fact combat-ready.

And so during 1960-61 RAF missiles that had been raised, lowered, fueled, defueled, tested, and repaired through many months of alert were flown to Vandenberg for firing. The procedure became routine. After arrival the missile was trucked into the RIM building where it was inspected inside and out, sub-standard parts were replaced, and telemetering equipment to record the missile's flight performance was installed and tested. The missile was taken to Complex 75 where it was fitted to a launcher and re-inspected. After it had been held in "ready" condition for some length of time, the launch was ordered to proceed and the missile was quickly fueled and fired.

These operations were highly satisfactory, for the RAF missilemen carried out their duties in a smoothly professional manner and the missiles demonstrated great accuracy and reliability. The CTL program proved that no aggressor could claim to hold Britain in captivity--for well-dispersed missiles spread in a shield across eastern England from Suffolk to Yorkshire could strike back with devastating effect against any target on the European continent.

CHAPTER IV

The ATLAS Program at Vandenberg

During the months that THOR was struggling towards operational maturity, the mesa's flat skyline was broken by massive new structures which signalled the arrival of America's first intercontinental ballistic missile—the ATLAS.

ATLAS is appropriately named. Capable of hurling thermonuclear warheads over distances of more than 5,000 nautical miles with great accuracy, it stands 81 feet tall and measures 10 feet across its waist. With a full load of RP-1 and LOX aboard, it weighs 130 tons. The two main engines together develop 300,000 pounds of thrust. Under a unique "one-and-a-half stage" arrangement, these engines drop off to lighten the missile after they have given it initial acceleration. A sustainer engine developing 60,000 pounds of thrust continues to burn and pushes the ATLAS into near-orbital speeds. Though ATLAS is primarily guided by an automatic pilot, its "D" model also has two radio-controlled vernier rockets whose thrust corrects slight errors in aiming and velocity.

Eventually the powerful ICBM will be deployed at a dozen or more installations scattered throughout the United States, but Vandenberg is the pioneering ATLAS base which first stood ready to retaliate against aggressors, and which trains crews for the remaining squadrons.

The Construction of Complex 576A

Vandenberg's ATLAS facilities received such high priority that the very first contracts awarded for construction on the base covered the ATLAS guidance station and MAMS. The contract for basic construction of the launchers themselves was signed two weeks earlier than the contracts for cantonment rehabilitation and THOR construction. This haste was essential. ATLAS was

barely out of the experimental stage, and much time would be needed to complete and test its support facilities.

As 1957 passed and the spring of 1958 approached, Launch Complex 576A took shape. By far its most famous facilities--plainly visible to passengers on passing trains--are the gantries, 135 foot towers looking somewhat like giant oil derricks. Each contains an elevator, hoisting slings, and several levels of platforms from which missiles can be maintained as they stand erect on their launch pads. The gantries are set upon three of the shortest and widest railway tracks in the world, 200 feet long and 50 feet wide, so that they can roll clear before firing.

But the gantries are only the most conspicuous structures in the complex. Each rides atop a concrete launch and service building which stores propellants and other supplies. A huge water-cooled flame bucket deflects the missile's exhaust away from the building. The launch control building, a thick-walled two-story structure, controls operations at the three launchers. A complete power generating station makes 576A independent of commercial power.

Somewhat farther away, (and not, strictly speaking, a part of the complex), is the "Mod II" radio guidance station. This marvel of science has radars, radio receivers, and electronic computers able to accomplish the intricate tasks of measuring a missile's path shortly after launch, swiftly predicting its impact point thousands of miles away, and correcting its aim by radio signals to its guidance equipment.

In April 1958, the 576th Strategic Missile Squadron was activated to conduct Vandenberg's ATLAS program. The ATLAS squadron chose for its motto the Latin verb ducimus, meaning "we lead." Its men were sent to

Convair's ATLAS plant and other facilities for their individual training, while the equipment they would use was still being perfected.

This missile refinement was a painful process. During the spring of 1959 a series of well-publicized ATLAS failures at Cape Canaveral created such great public concern that AFBMD's General Bernard Schriever had to assure Congress that such setbacks were normal in a development program. His faith was borne out the same day he testified, when an ATLAS "D" was successfully fired from the Cape. By this time the Vandenberg facilities were complete, and ATLAS missile 12D was erected inside its gantry. On August 22, 1959, 12D sent its hot breath into the flame bucket as a static firing tested both missile and ground equipment. The test was so successful that on September 1 SAC accepted control of the launchers from AFBMD.

On the morning of September 9, five years of ATLAS development culminated in the first launch by an operational crew. William Misslin, managing editor of the Santa Maria Times, wrote a graphic description of the event:

> "As the final 15-minute countdown started, there were only a few flecks of clouds in the sky, and none to the west where the missile was aimed. A gray haze formed a backdrop for the 83-foot high missile as it stood alone on the launching pad, its oil derrick-type gantry rolled back out of the way.
>
> As the liquid oxygen and RP-1, a kerosene-like hydrocarbon fuel, were pumped into the vehicle, it started to "fume" and "smoke"...When the count reached T-90 seconds there was a scheduled hold...It lasted about 20 minutes...and the count resumed. On down it went, the tension mounting with each announcement.
>
> Then the shout came from the observers, just 9,200 feet from the launch pad. "There's fire in the tail."

> ...[It] quickly exploded into a large orange ball. Slowly the powerful engines...raised the 250,000 pound missile upward. Gradually it began to gain speed, and as it cleared the gray haze it appeared as a huge silver bullet pushed by a ball of flame. Higher and higher it went, straight up into the heavens, as gasps of admiration and amazement escaped from the onlookers.
>
> As it cleared the horizon the noise, like that of a hundred freight trains, increased in intensity. There were sharp cracks in the thunderous sound, and then the noise washed over the observation site and all that was left was the silver bullet and the ball of flame."

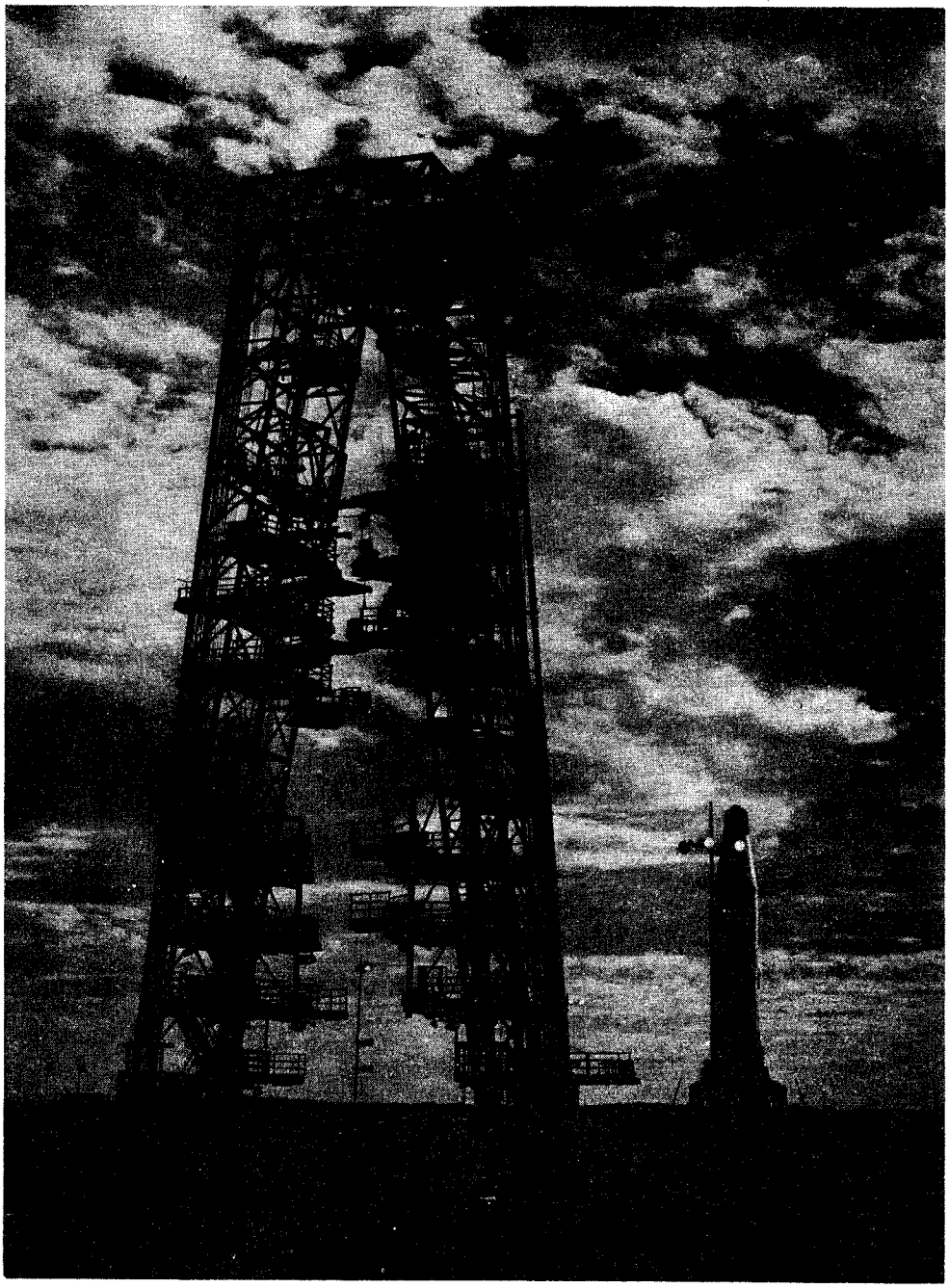
The missile hurtled towards its selected target 4,400 miles away near Wake Island. General Power, an eyewitness of the launch, declared that the operation was "a tremendous milestone" in the history of the Air Force--a successful team effort by American science and industry, the Air Research and Development Command, and the Strategic Air Command.

The 576th Goes Operational

In the weeks following the launch, a certain amount of "tidying up" was necessary. The accuracy of maintenance checklists had to be verified, and the APCHE (automatic checkout equipment) had to be put into service. The men of the 576th pitched in eagerly, for morale in the squadron was high. Its commander reported that his men

> "are in missiles because they want to be in missiles. They regard themselves not as men of war, but as men of peace who are making important contributions to the prevention of another war."

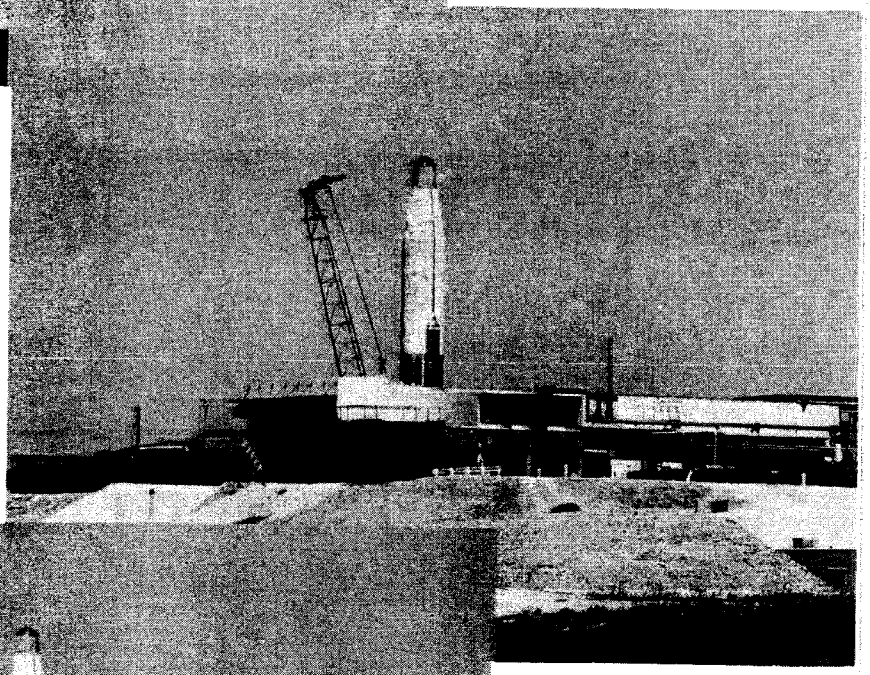
During October 1959 the 576th went on operational alert, and on November 3 General Wade announced to the world that "the ATLAS squadron at Vandenberg is now integrated into the Strategic Air Command's emergency war plan, and is ready to launch on 15 minutes notice." Playing a vital if unobtrusive role in that alert was another pioneering organization, the

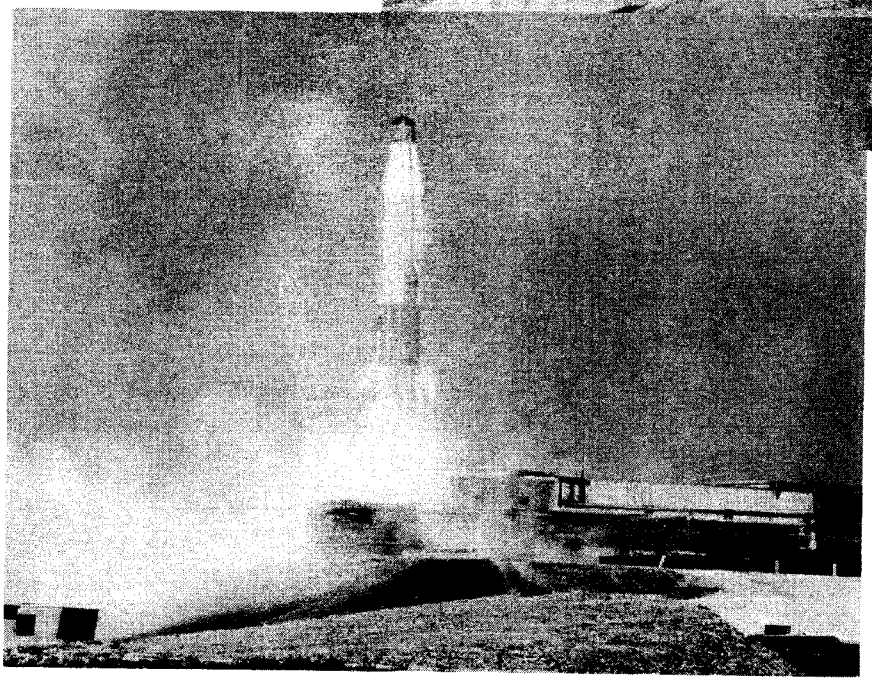


An ATLAS on alert at Vandenberg AFB

Coming up..

Fueled...





And fired...

"Quick Start" inaugurates 576B on April 22, 1960

51st Munitions Maintenance Squadron. Its men guarded and maintained the base's arsenal of reentry vehicles, installing and removing them as ATLASES went on and off alert.

The men of the 51st and 576th were ushering in a new era of Air Force combat readiness. Until then alert operations had been punctuated by the whine of jet engines, the thump of tires on concrete, and long bomber-tanker flights through the sky's ever-changing panorama of sunshine and clouds and rain. With a missile everything centered around maintenance. The "bird" sat endlessly waiting while its crew watched console lights and used instruments and tools to keep it ready for firing. But within the nose cone of an alerted missile was the deadliest device yet invented by men. Everyone hoped ardently that the horror compressed within that nose would never be released—and its very deadliness was a bulwark against aggression.

The 576th Turns Schoolteacher

Yet Vandenberg's ATLAS facilities did not all become quiet, for other ATLAS bases were moving toward completion. On February 3, 1960, the first crews from the 564th Strategic Missile Squadron, Warren AFB, began receiving team training from the 576th's instructors.

In its general outline ATLAS IWST—or ORT (Operational Readiness Training), as it later was renamed—duplicated the training given to THOR crews. It was somewhat more elaborate because the missile was more elaborate. Eleven men made up an ATLAS launch crew; sixteen men, a guidance team; eight men, a maintenance crew working in the hangar or MAMS. Some ATLAS crew training was carried out in the classroom, but much of it took place in operational missile facilities. Trainees became familiar with the term "bugged component." Their instructors rigged equipment so it

would work improperly, and required their students to locate and remove the malfunctions.

Special training aids were put into service to release missiles and supporting equipment for alert duty. A giant dummy was used to train men learning how to move missiles. Men being trained by the 51st MMS to handle warheads used a dummy reentry vehicle and the forward section of an ATLAS body. By far the most elaborate piece of special equipment was the "crew procedures trainer," a missile-age successor to the "Link trainer" of aviation fame. Though the CPT was housed inconspicuously inside an old barracks, its simulated control rooms were an impressive sight. Each launch and guidance trainee had already received individual instruction from the Air Training Command in the use of his own type of control console, but at Vandenberg he learned to act as the member of a team--to coordinate his actions with those of other crew members at other consoles. The CPT's consoles were wired to act as if a single missile was sending impulses to them. The system could in effect be "bugged" to simulate various emergencies, and its flashing lights and insistent buzzers gave crew members experience in the making of swift and accurate decisions.

The crew procedures trainer was a vital tool in an age of multi-million dollar missiles. ATLASES could not be shot into the waters of the Pacific for ordinary practice, and it was expensive to constantly work their parts during "dry runs." The crew procedures trainer could simulate an entire launch at the cost of a little electricity.

Complex 576B Joins the Force

During the spring of 1960 Vandenberg's ATLAS facilities were swelled by the completion of a second radio guidance station, and the three launchers of Complex 576B. Duplicating ATLAS "D" complexes in the field, 576B houses its missiles horizontally inside sliding-roof launch buildings which protect the missile from the weather and make maintenance more convenient. The new complex received its baptism of fire on April 22, when a crew from the 564th SMS launched missile 25D into the Wake Island target area.

Other training launches followed occasionally and gave field squadron crews an opportunity to witness ATLASES in operation. The U. S. Navy's Pacific Missile Range was an active participant in these launches, for the "Burke-LeMay Agreement" of September 1959 had given PMR full responsibility for range safety. In the spring of 1960 the 704th Instrumentation Squadron began turning over its safety equipment to PMR. A safety center was constructed on the naval missile facility at Point Arguello. In June 1960 the PMR assumed "command destruct" responsibility for all test and satellite launches from Vandenberg. As a practical matter it subsequently controlled the destruction of all erratic missiles, since Air Force officers manning the safety console during training launches relied upon information supplied by PMR's equipment. The combined operation worked smoothly.

The Golden Ram Project

Unfortunately errant missiles became all too familiar at Vandenberg during 1960, for the ATLAS was not yet perfected. On March 7 a practice fueling at Complex 576A ended abruptly when the missile exploded and burned. As usual there were no injuries, but the launcher was seriously damaged and the Division began to substitute inert liquid nitrogen for oxygen in practice

fuelings. ATLASES launched on May 6 and July 22 went out of control shortly after lift-off and broke up. On October 29 another missile exploded like a spectacular display of fireworks after it had climbed to 60,000 feet during a night launch. No one was injured in these mishaps because of the wide safety zones thrown beneath the missiles' flight paths.

The deficiencies which caused these accidents were the genesis of Project "Golden Ram"—an intensive joint study by four Air Force commands and ATLAS' prime contractors of every aspect of the weapon system's design and operation. Teams of engineers analyzed the functioning of the missile and its ground support equipment during each step in its life cycle at Vandenberg—from the initial MAMS inspection through practice fuelings and checkouts to firing. Three launches accompanied this effort. The investigators pinpointed various design changes needed in the missile and its support equipment.

Simultaneously, another team studied the human aspects of missile maintenance, including the training given to missile technicians, the adequacy of the tools and manuals which they used, and working conditions inside the MAMS. After months of observation and interview, the analysts were able to locate certain trouble areas of missile maintenance. The successful conclusion of "Golden Ram" was marked by the launch of August 22, 1961.

ATLAS testing would continue. A "Category III" program carried out entirely by Strategic Air Command crews would insure that all details of the weapon system's design and maintenance methods were in harmony with conditions existing at operational bases. "Big Push", the first operation

of this program, was completed on November 29, 1961. Another launch followed on December 7, and still more will occur during 1962.

In the midst of the testing program, training of ATLAS "D" crews had continued and was completed on May 19, 1961. The Division enlarged its services to the field squadrons by sending specialists on inspection visits, and starting to train replacement crews. Thus by the end of 1961 the Division had played a large role in the creation of four ATLAS squadrons guarding the United States.

ATLAS "E" Appears at Vandenberg

Meanwhile the "E" model ATLAS was appearing at Vandenberg. A simplified version of the "D", it has no radio guidance system but relies entirely upon a highly sophisticated autopilot. ATLAS "E" launchers are sunk into excavations with only their roofs visible, and thus have greater resistance to bomb blasts.

Two "E" launchers and a new MAMS were built at Vandenberg. The base's "E" program will resemble the "D" program, with extensive weapon system testing and a training program geared to the needs of "E" squadrons being created in the field. A new crew procedures trainer was installed, and the first class began to receive instruction on January 30, 1961.

On June 7, 1961, the "E" program was marred by the spectacular explosion of a test missile shortly after lift-off. No one was injured, but the flaming fuel cascaded over the launcher. The newspapers ran bold headlines and photos of the conflagration. Unfortunately the facts that the launcher was soon repaired, and the training of "E" crews went ahead, received scant publicity.

Undoubtedly the ATLAS program caused many early disappointments. Because the weapon system and the procedures for using it had been developed with haste, there had been spectacular failures. But experience gradually pinpointed and eliminated ATLAS' weaknesses. And the missile was one more deterrent to nuclear war, for even a handful of ATLASES could inflict dreadful destruction upon an aggressor.

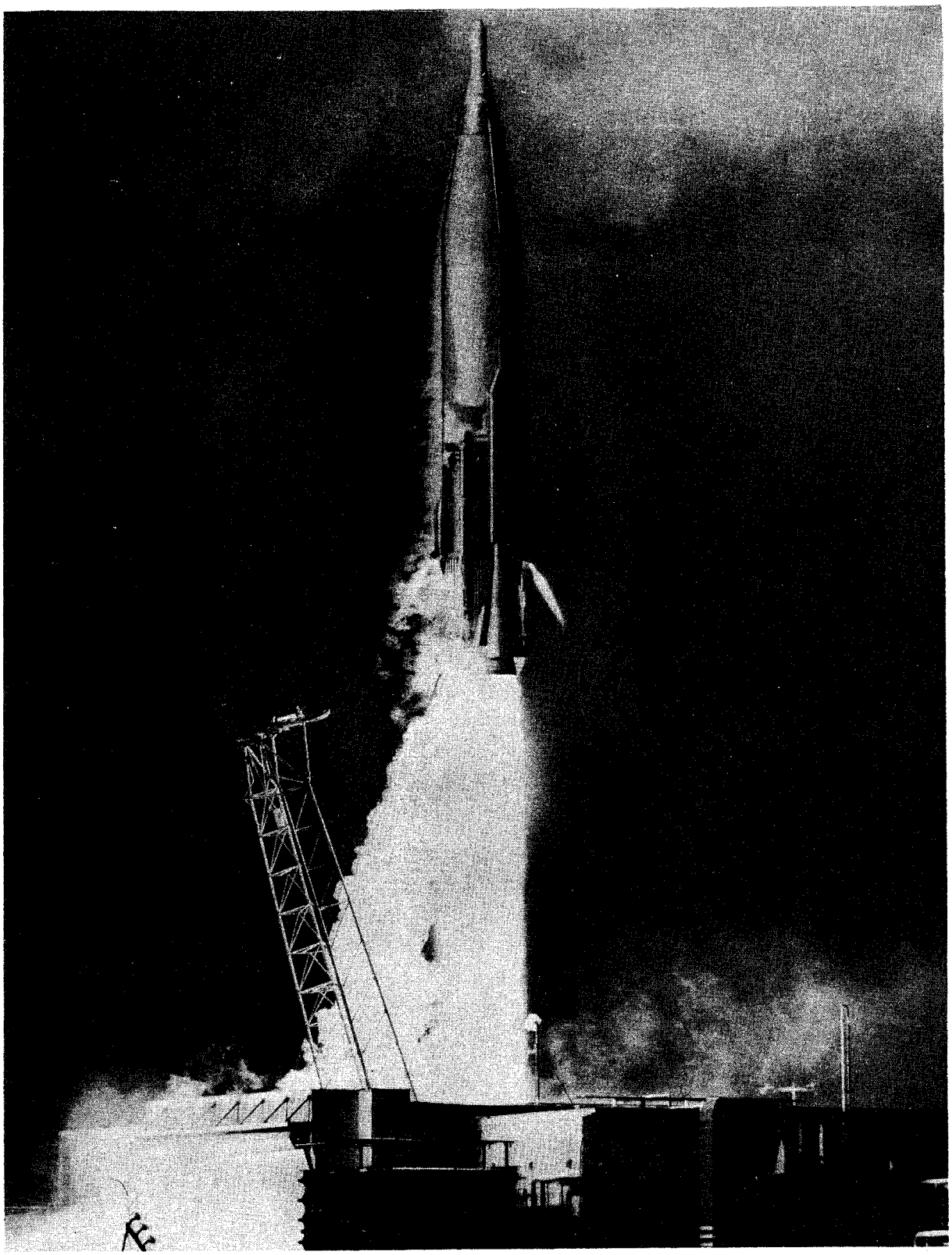
CHAPTER V

The Base Becomes a City

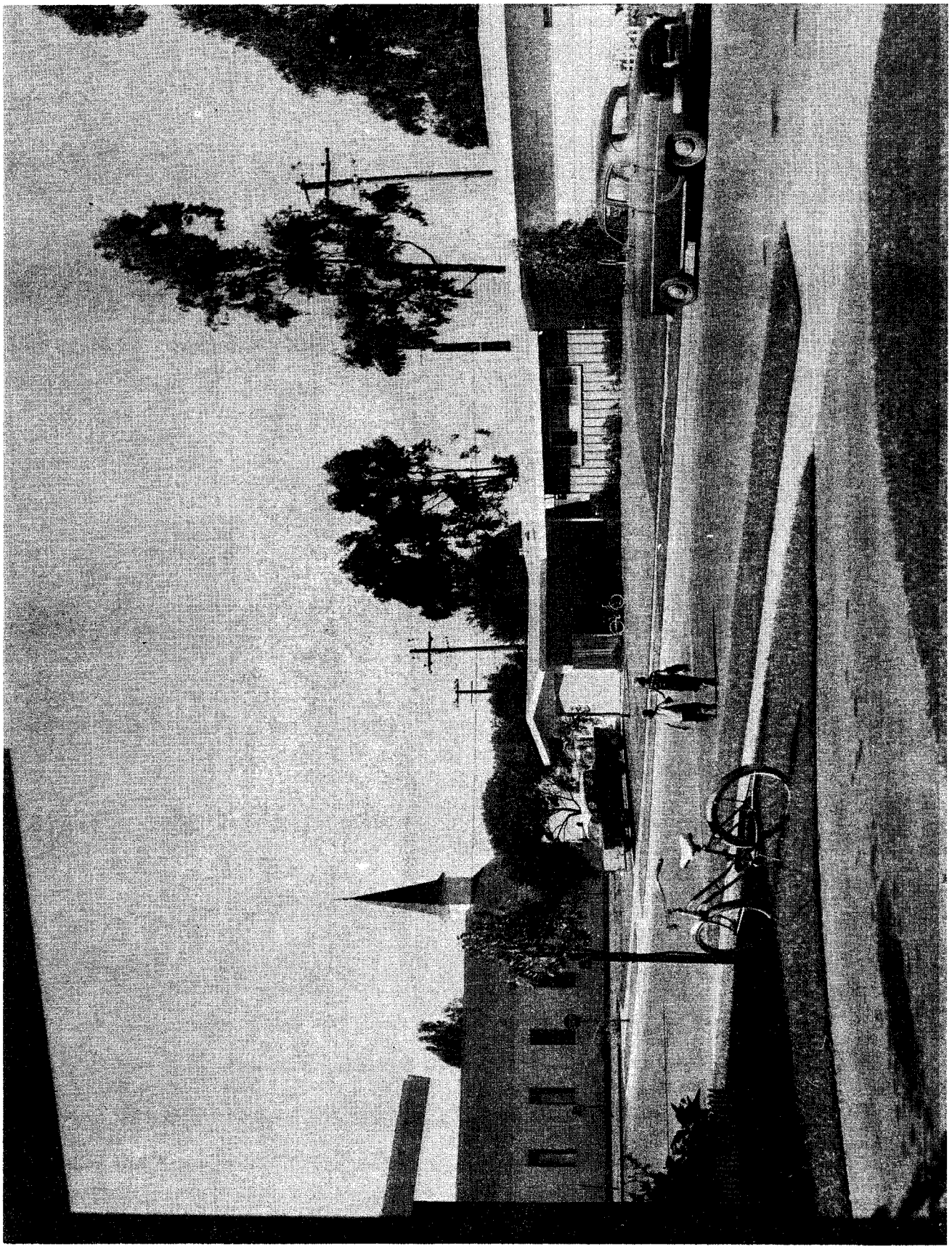
While THOR and ATLAS were attaining their wings and preparations were being made for other missile programs, Vandenberg's cosmopolitan population continued to soar. By the summer of 1959 11,000 people worked on the base, and there were over 18,000 by mid-fall of 1961. The base became the home of diverse military organizations. One-fifth of its Air Force men belonged to non-SAC "tenant" units—the 6595th Aerospace Test Wing, the 1352d Photo Squadron, the 6596th Instrumentation Squadron, the 775th Aircraft Control and Warning Squadron, and still others. Three hundred and seventy men of the United States Navy—the entire military population of Point Arguello—lived at Vandenberg.

A large majority of the base's working force—10,771, to be exact—were civilians. Some belonged to the Federal government's civil service, and some worked for the private companies which operated dining halls and other support activities under contract; but over 8,000 were employed by Douglas, Convair, Martin, Boeing, and other manufacturers building missile facilities at Vandenberg and Point Arguello.

Vandenberg's workers served in a multitude of occupations. Some controlled missiles. Others maintained the complex of pumps, pressure regulators, gyroscopes, switches, and other equipment which make up a



Operation "Big Push", November 29, 1961



Vandenberg — home of twenty-four hundred families

missile's working parts. Still others computed trajectories, interpreted telemetry signals, calibrated testing equipment, and carried out all the other duties directly connected with missile operations. But no less vital were the supporting workers—administrative specialists, vehicle operators, supply specialists, air policemen, cooks, personnel technicians, and many more.

The base's support operations piled up formidable statistics. Air police issued three to four thousand vehicle passes a month, and inspected them as automobiles and trucks streamed on and off the base. Ordinarily they did not keep traffic statistics, but a special count taken one Thursday in February 1961 revealed that 19,000 vehicles entered and left that day—3,000 more than base authorities had supposed. Hundreds of security investigations were handled each month. Base supply carried 38,000 different types of equipment on its records, and processed issues and turn-ins at the rate of a half million a year. The motor vehicle squadron's drivers rolled up 1.4 million miles from the summer of 1960 to the summer of 1961. The civil engineering squadron maintained 218 miles of roads, 1277 buildings, a 6 million gallon a day water plant, a 3 million gallon sewage plant, and 1.7 million feet of power lines. Its repairmen made 4000 service calls a month. The food service squadron served 160,000 meals each month. The medical group gave as many as 10,000 outpatient treatments a month, and cared for 75 to 85 hospital patients. Finance paid out far more than $100,000 a day.

Many vital base support activities could not very well be described with statistics. The 135 men of the fire and crash department fortunately had few emergencies to deal with, yet their hours of duty were absolutely

essential to the effective operation of the base. Workers at the service club and base gymnasium were able to approximate the man-hours of recreation enjoyed each month--but the value of recreation cannot be meaningfully described in figures. And so it was with the output of missile site guards, radio operators, and many other workers. It is enough to say that their work was vital to the life of the base.

As Vandenberg's population increased, its physical plant improved. The spacious runway of a new airfield was able to comfortably accommodate jet aircraft and the heavy transports which flew entire missiles from manufacturing plants to the base. By the fall of 1961 it was handling 3,000 take-offs and landings a month. Vandenberg's older buildings continued to improve. Few Army structures remained untouched by remodelling, and dozens of old wooden buildings were turned into modernistic-appearing stores, clubs, and other structures through liberal applications of lumber, plywood panelling, and stucco. Sometimes two buildings were joined together, and the largest remodelling project combined twelve two-story barracks into a striking new three-wing headquarters for the base support group. The largest building on base was the three-story Division headquarters, opened in April 1961. Built new from the ground up of reinforced concrete, this ultra-modern office building dominated the central cantonment and stood as a symbol of the fact that the Air Force expected to be carrying on large-scale operations at Vandenberg for many years to come.

The base's family life cntinued to expand. By the summer of 1959 some 1405 Capehart homes were occupied, and 400 more were added during 1960. New trailer courts brought the total number of trailer spaces up to 569. The women and children living on Vandenberg outnumbered the men

by some 3,000. The three schools on base enrolled 1900 elementary and 575 junior high students; like many another community, Vandenberg was planning to build a new junior high school. Playgrounds, little leagues, and other children's activities continued to expand. United fund appeals became large scale operations.

Like other cities, Vandenberg's population spilled outside its boundaries. Thirteen thousand workers and over 25,000 of their dependents lived off base. Over half of the people of Lompoc and Santa Maria were directly connected with Vandenberg. Over nine thousand Vandenberg children attended public schools in the area. The base poured $6 millions a month into the local economy, which rose to dizzy heights. A building boom created whole new communities of tract homes and shopping centers. Though the rate of expansion seemed to be declining, the end of large-scale construction was not yet in sight. Two-fifths of Vandenberg's workers were purchasing homes in the area.

Who could write the history of this aspect of Vandenberg's life? It was as broad as human experience, encompassing the multitude of joys and hopes, sorrows and disappointments that surround family life. And Vandenberg's families were of vital significance to the base's mission. Good missile maintenance comes from high morale as well as from skill and discipline, and the creation of a force of career missilemen depends upon the willingness of skilled airmen to reenlist. The development of a well-rounded community life surrounding the base was thus as important to its immediate and future functioning as well-stocked supply warehouses, or up-to-date technical manuals.

* * *

Unfortunately, like many another city, Vandenberg was afflicted with housing and traffic problems.

Although private builders erected thousands of new homes in the area, the construction barely kept pace with Vandenberg's soaring population. Rents remained very high, and lower-ranking married airmen continued to suffer great hardships. Forced to spend as much as 40 percent of their regular incomes on rent, many took second jobs during their off-duty hours to support their families. Key Division officers repeatedly urged that more Capehart homes, on-base trailer space, and low-cost private housing off base be provided for their men; but neither they nor their Air Force superiors had money or authority to alleviate the housing problem.

The traffic problem was closely linked to the housing problem. Men commuted to their work, and sometimes travelled great distances in order to live in low-rent areas. They had to use private autos, since public transportation was nonexistent in the area. The Army had constructed few roads into Camp Cooke, since its transient population had done little commuting; consequently Vandenberg's workers drove their cars to and from the base over a handful of roughly-surfaced two lane roads whose steep grades were clogged by large trucks. By the fall of 1961 the base was staggering working shifts where possible in order to reduce congestion, but this could not eliminate the problem. Since most workers commuted over distances of ten to twenty miles, transportation was not only tiring but financially costly. Vandenberg's workers spent $1 million of their pay on transportation each month--a proportion well above the national average. Bus lines, and four-lane highways with reasonable grades, were not within sight.

Whether the housing and traffic problems could be solved, and whether they would perpetuate a serious morale problem, remained a great question as 1961 closed.

CHAPTER VI

The ICBM Goes Underground

A new phase in Vandenberg construction began during 1958-59 as workmen opened great holes in the shale highlands above the northeast corner of Burton Mesa. As the months went by massive cylinders of steel and concrete, dubbed "silos" by the Air Force, rose within some of these pits, while control centers, powerhouses, fuel tanks, and guidance antennas appeared inside other excavations. The ten-foot rotary blades of tunnel borers gnawed connecting passageways between these structures. This construction denoted the fact that American ICBM's were going underground--to become an even more potent force for peace. Only a direct hit from a nuclear weapon could destroy an underground launcher. Ultimately hundreds of missiles would be buried across the United States, a target which no aggressor could hope to destroy in a surprise attack.

The TITAN Program

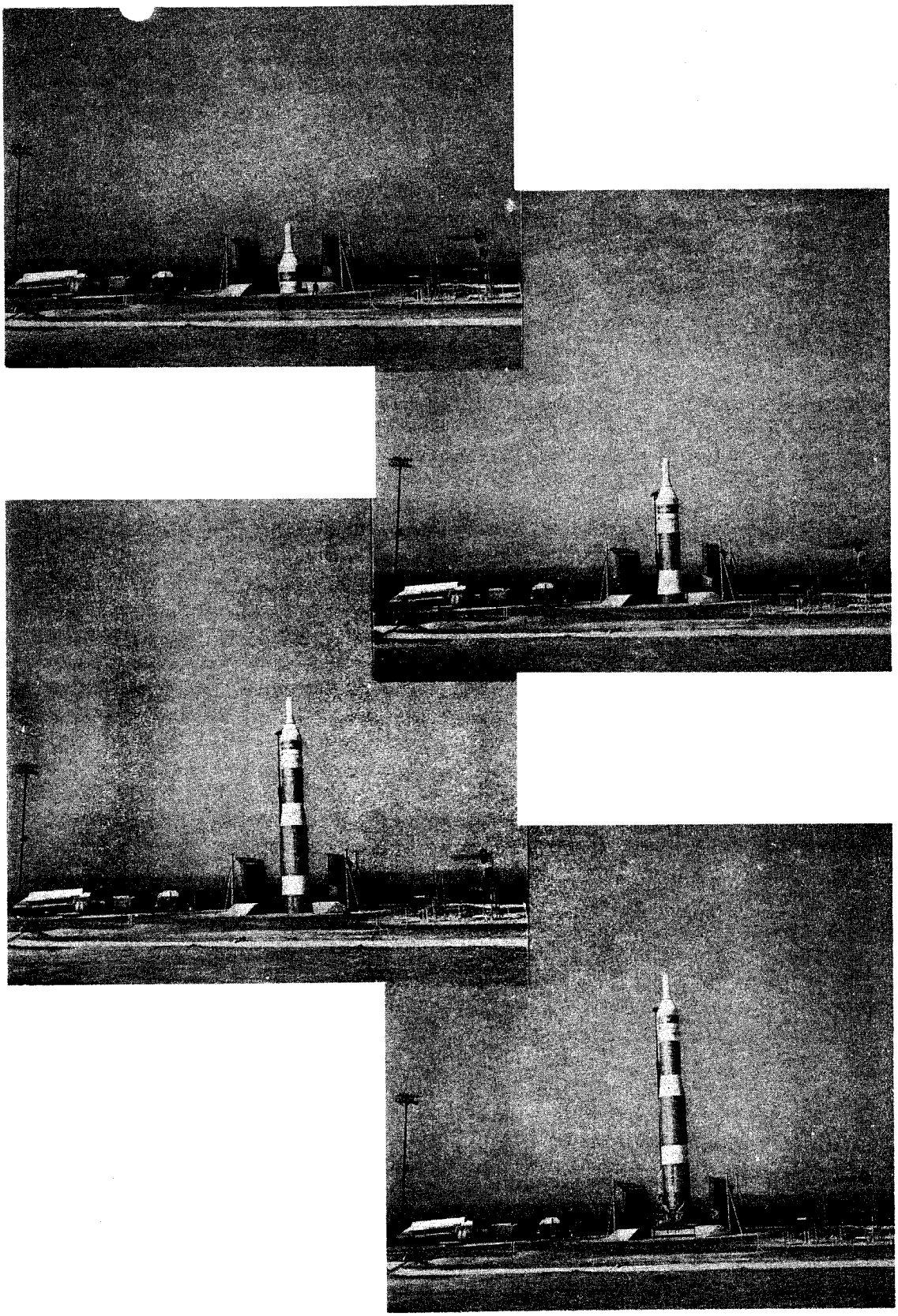
Vandenberg's first underground program centered around the Martin Company's TITAN I. Though TITAN is somewhat taller, more slender, and lighter than ATLAS, it differs most strikingly by being two complete rockets in one. The powerful engines of the first stage accelerate both rockets to a speed of 5,300 miles an hour within two minutes. Its fuel exhausted, the first stage then separates and falls away while the second stage's engine fires. The second stage hurls the bomb-carrying reentry vehicle into near-orbital speeds--almost 16,000 miles an hour. TITAN's trajectory reaches some 500 miles deep into space.

TITAN I is a "silo-lift" missile. The three missiles of each launch complex are normally sealed within their silos beneath 263-ton steel and concrete doors. Miniature silos protect the radio guidance antennas. When the complex is ready to fire, the silo and antenna covers hinge upward, and the three missiles, resembling giant bullets, rise atop huge elevators while the dish-shaped antennas emerge inquisitively. The missiles are fired after they have been raised to the surface, and the complex then draws elevators and antennas beneath their covers once more.

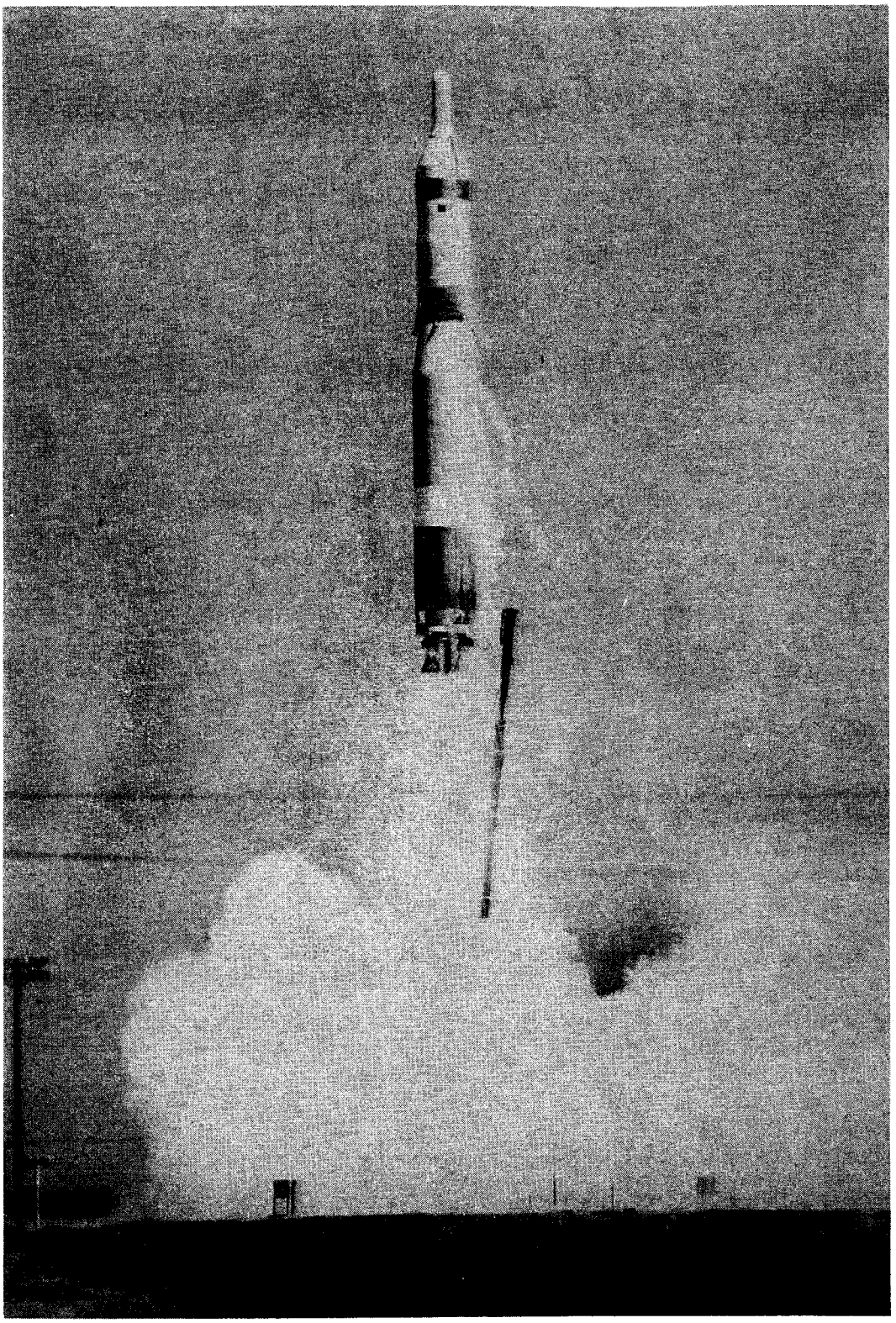
To support its TITAN I program, Vandenberg received a new missile maintenance building, a single-silo Operational Systems Test Facility (OSTF), and Complex 395A, a near-duplicate of the complexes being built at field bases. Unlike other TITAN I complexes, its control center contains twin control rooms so that it can accommodate more students. This complex took its number from the 395th Missile Squadron, activated at Vandenberg in February 1959. While construction went ahead at 395A, the squadron's cadre received its training from the Air Training Command and at manufacturers' plants.

Trouble in the Silos

Since the OSTF and 395A were the first underground launch complexes in the United States--probably the first in the world--many unforeseeable difficulties occurred during construction. Workmen encountered small pockets of methane gas which had to be carefully emptied and sealed. The shale contained so much salt that metal tunnel linings began to corrode because of electrical interaction between the steel and the rock, and special measures had to be taken to ground the tunnels. Treatments were necessary to prevent corrosion and mineral deposits from ruining the complex's water system. The 395A powerhouse was intolerably noisy until



A TITAN is raised into firing position at Complex 395A



"Big Sam" verifies a launcher design, September 23, 1961

an extensive soundproofing project was carried out. Dust filters had to be installed over the air conditioning ducts, and a good deal of modification was necessary to perfect the lighting and communications circuits.

These problems paled alongside the accident which occurred on December 3, 1960, as technicians were lowering a fueled missile into the OSTF as part of the checkout for the first test launch. An accident set the missile on fire, and intense flames roared up the silo while the violent outflow of heated air picked up fragments of steel and concrete and scattered them widely around the silo mouth. There were no injuries, since no one was in or near the silo (a standard precaution when a fueled missile was installed) and the blastproof doors sealing it off from its control center and powerhouse held firm. But the silo was completely destroyed, and the Air Force accumulated painful if vital experience in the problems of silo launchers.

This accident delayed the first silo firing of a TITAN for several months. The elevator hydraulic systems in Complex 395A were modified, and its blast doors were strengthened to provide an extra margin of safety. The Division revised its safety standards to prohibit anyone (except essential personnel under cover in the powerhouse and control center) from being within 2,500 feet of a silo containing a fueled missile. These precautions seemed to insure that Vandenberg's record of never having an injury in a missile accident would continue.

At length the modifications were completed. On September 23, 1961, operation "Big Sam" sent a TITAN roaring aloft from 395A's launcher number one. The ground equipment worked perfectly and proved that the silo-lift concept was practical. Thus a giant gamble in "concurrency"--the construction of TITAN launchers at several bases before their design was test-proven

--paid off. Within a few more months TITAN complexes at Lowry AFB near Denver would become operational, and TITAN sites would multiply as 1962 passed.

The 395th meanwhile had been completing the training of its own men. One group had helped fire TITANS from Cape Canaveral, and a large part of the squadron worked alongside Martin engineers as they put the finishing touches on 395A. In March 1961 the 395th began giving classroom instruction to the lead crews from Lowry. Soon Lowry missilemen would be training inside the 395A control center and on a new crew procedures trainer using surplus consoles from the OSTF control center.

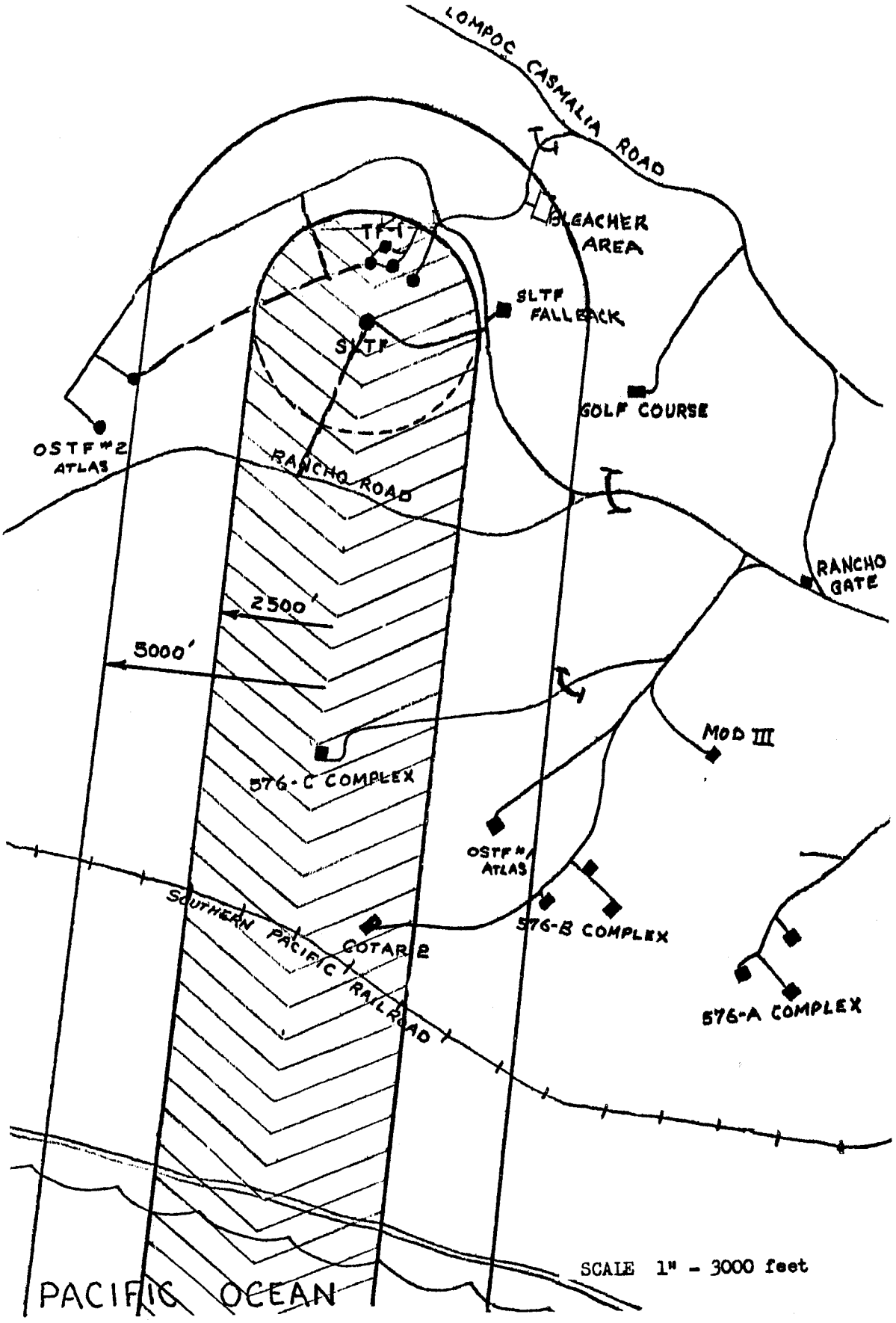
As 1961 drew towards its close, the ATLAS squadron was also preparing to train men in the operation of silo-lift missiles. The "F" model ATLAS, a further refinement of the ATLAS "E", will operate from widely-dispersed elevator launchers. Test and training silos are nearing completion at Vandenberg, and three crew trainers are being installed. Before many months pass any aggressor will have to reckon with a strong force of ATLASES placed underground at several bases.

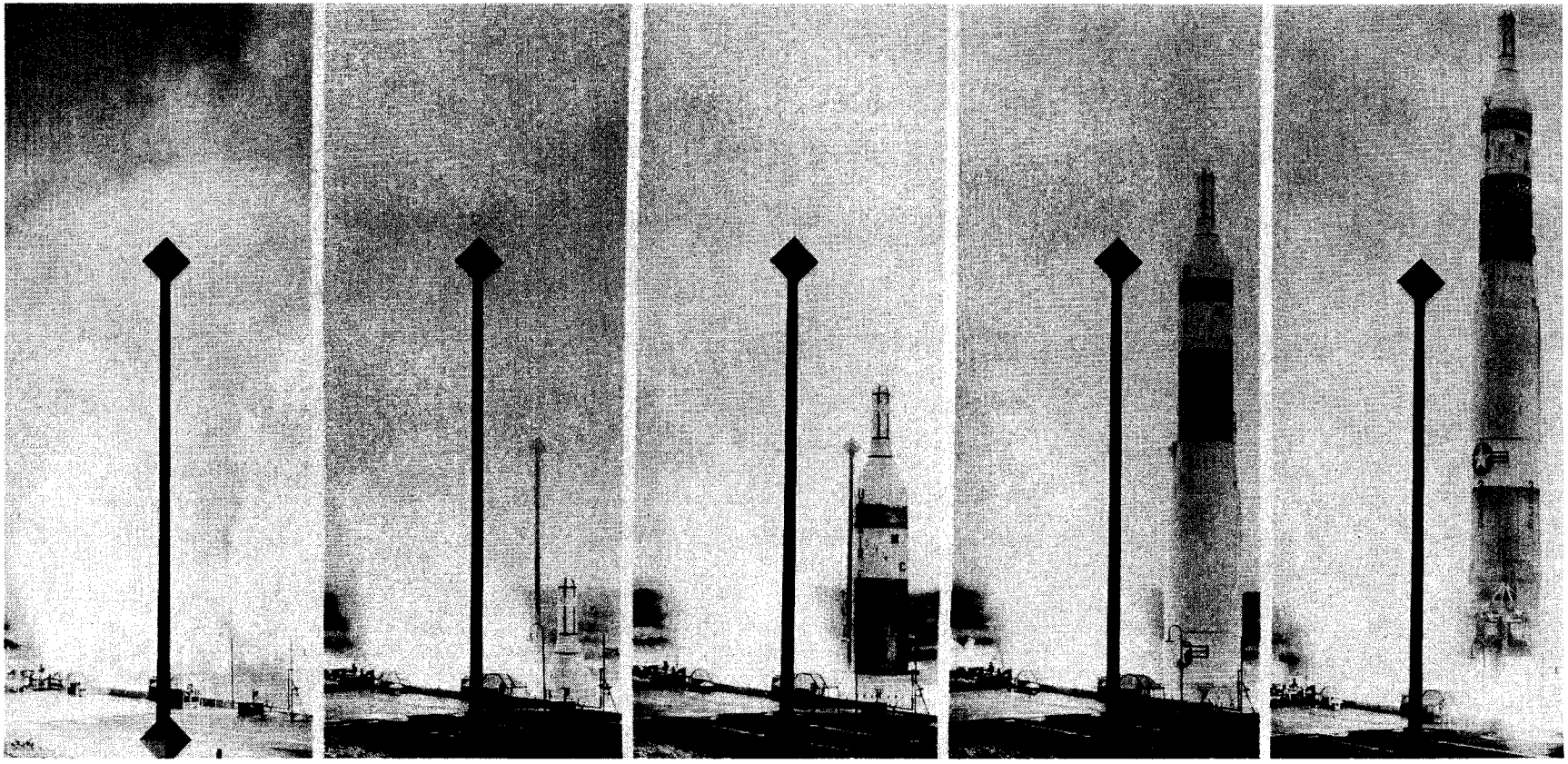
TITAN II Mounts a "Silver Saddle"

But the ultimate in protection of missiles is the "silo-launch" method. A missile fired directly from the bottom of its silo is even less vulnerable to attack.

Formidable technical problems had to be surmounted. Although a liquid-fueled missile attains almost fantastic speeds during its flight, it moves slowly during the first few seconds after engine ignition because of the vast inertia which must be overcome. During those seconds unbearable heat and vibration would build up within a silo's narrow walls unless

SLTF (TITAN) FLIGHT HAZARD CORRIDOR





The first TITAN in-silo launch, May 3, 1961

the engine exhaust could be vented. Air Force engineers developed the "flame deflector," giant curved tubes to receive the missile's exhaust and carry it into the open air. TITAN II's flame deflector is shaped like a W, with the missile sitting atop the center peak of the W and the flames exhausting on the surface at each cap while the missile emerges between them.

A 145-foot deep Silo Launch Testing Facility (SLTF) was constructed at Vandenberg. Even before it could be used, workers were constructing three additional TITAN II launchers at Vandenberg and still more at other bases. The program was a bold application of "concurrency." There was not enough time to wait and test one silo before others were begun--unless the nation's defenses were to be weakened. Scale-model tests using small rockets had indicated that the silo-launch concept would work--but the crucial full scale experiment was reserved for Vandenberg's SLTF.

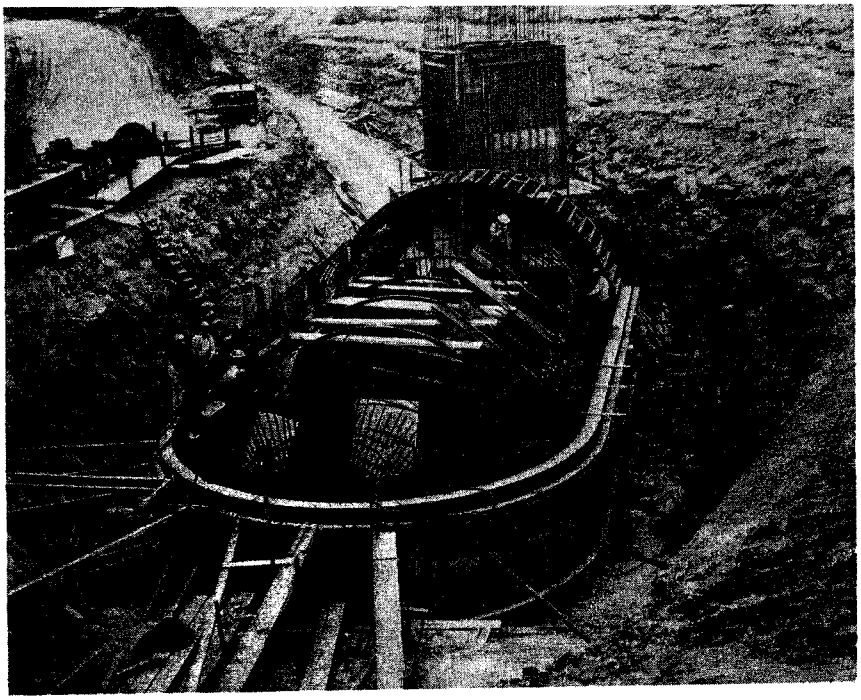
Since the test was of the launcher rather than the missile, a specially-instrumented TITAN I carrying fuel only in its first stage was used. TITAN missile number VS-1 was lowered into the SLTF in October 1960, but before an elaborate checkout was completed the OSTF explosion caused a "searching reexamination" of SLTF operating procedures. After a few modifications were made to insure absolute safety, the test preparations continued. On 7 March 1961 came the first static firing, when VS-1's engines were ignited and sent their flames racing up the ducts to frame the silo entrance between twin pillars of fire and smoke. Additional sound-proofing was installed and Operation "Silver Saddle" was scheduled for early May. The Pacific Missile Range obtained permission to destroy VS-1 in mid-air in a test of the command destruct system.

Wednesday, May 3, was a blustery day at Vandenberg. Wind gusts of up to 35 knots covered the ocean with whitecaps and swirled over the silo as the TITAN was readied deep inside the earth. The launch control officer checked off the items on his long list. At length he activated the batteries and pressure pumps, closed the LOX vent, disconnected the fire alarm, and ignited the engines. VS-1 strained against the retaining bolts as the rockets built up thrust. The missile was released, and two seconds later the tip of the nose cone appeared at the surface. Slowly the massive cylinders of the first and second stages rose majestically out of the silo. The electrical control lines pulled free a few seconds after lift-off, and VS-1 began swinging left as its autopilot aimed it due west over the Pacific. The first stage pushed the missile high into the sky and burned out. Several seconds later a puff of smoke signalled that the command destruct system had functioned properly. TITAN VS-1 ended its brief but spectacular career as a mass of fragments plummeting into the Pacific.

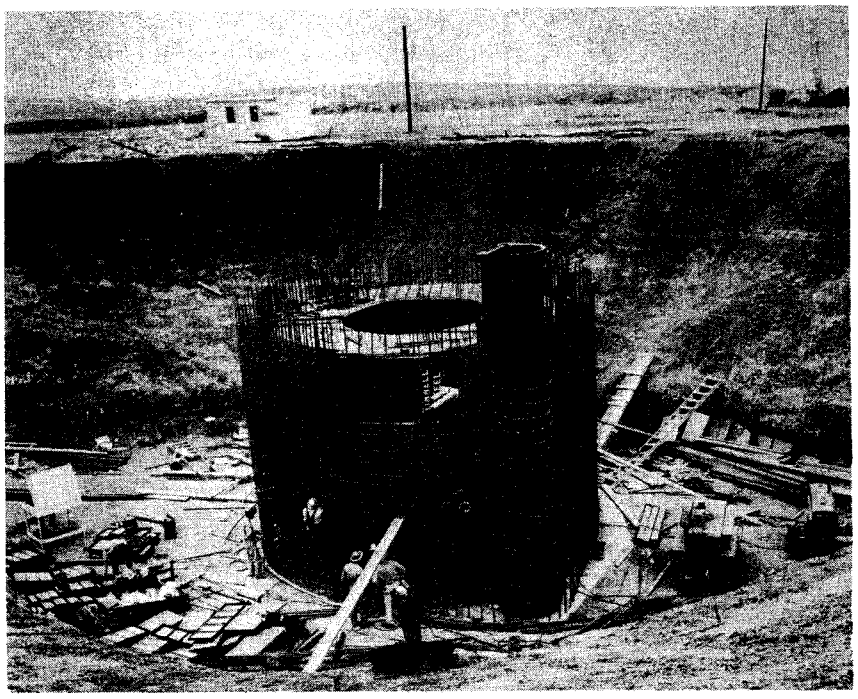
Operation "Silver Saddle" was a brilliant success. The missile survived the stresses of launching so well that General Power (an eyewitness of the test) declared

> "In confirming the validity of the silo launch concept, today's shot marks a major advance in our intercontinental ballistic missile program. The TITAN II missile that is being developed to operate in this mode will offer big dividends in payloads, reaction time, and added survivability."

In subsequent months the construction of TITAN II facilities at Vandenberg and elsewhere went ahead, while plans for the training of combat crews were refined.



A MINUTEMAN control center and silo
under construction at Point Sal



Major Generals Wade and Preston during a change of command ceremony at Vandenberg, June 30, 1961

The MINUTEMAN Program

During 1961 the shells of six silos and an underground control center rose among the Casmalia Hills above Point Sal to herald the arrival of Vandenberg's fourth missile--the unique MINUTEMAN.

MINUTEMAN is strikingly different from the earlier missiles, for it is a three-stage solid-fueled missile which can be fired on a moment's notice by a handful of men in a distant control center. Its simplicity keeps maintenance costs low, so that the United States can economically maintain many hundreds of dispersed MINUTEMAN missiles in combat readiness, each protected by a heavy sliding door as it waits inside its silo. No aggressor could expect to destroy the entire force in a surprise attack. MINUTEMAN will not entirely replace TITAN, since it carries a smaller warhead; but it will add the final touch of perfection to the Free World's deterrent shield of missiles.

Though MINUTEMAN differs radically from Vandenberg's other missiles, the general outlines of its program will be the same. The launchers on Point Sal will be used to test the weapon system, train combat crews, and--if need be--retaliate against an aggressor. Three crew procedures trainers housed in a new building on Nevada Avenue will aid the training program. The 394th Missile Squadron, activated in July 1960 to manage these activities, will have instructors who have been trained at Cape Canaveral, the Boeing production plant in Seattle, and North American Aviation's guidance system factory at Downey. Eventually the 394th's program will absorb a large share of Vandenberg's missile activities.

* * *

Even as the passage of time was bringing a "second generation" of intercontinental missiles to Vandenberg, so it was bringing a new group of men to manage the underground programs. One by one the men who had served at Vandenberg in its early days were transferred to duty elsewhere. On June 30, 1961, the most notable transfer occurred as General Wade left for Spain to become commander of the Sixteenth Air Force.

Succeeding him was Major General Joseph J. Preston, who had already become familiar with the new generation of ICBM's through his service as commander of the MINUTEMAN wing being formed at Malmstrom AFB, Montana. General Preston soon was in command of an old organization with a new name. On July 21, 1961, the 1st Missile Division was renamed the 1st Strategic Aerospace Division. The addition of "aerospace" offered eloquent testimony to the fact that the United States Air Force was no longer limited in its operations to the earth's blanket of air. It now had the ability, as a matter of routine, to send its weapons flashing swiftly hundreds of miles above the atmosphere, and to provide the earth with new satellites circling in the intense cold of outer space.

CHAPTER VII

Vandenberg and Outer Space

In 1956 artificial earth satellites were only a scientist's dream, and the men who selected Camp Cooke as the site of America's first operational missile base gave no thought to its value as a satellite center. Yet over half the rockets fired from Vandenberg during its first three years of launch operations were satellite-carriers.

The addition of this giant program to Vandenberg's primary mission reflected the nation's growing interest in space exploration, but there

were particular reasons why the program was carried out at Vandenberg rather than some other base. Vandenberg's location is nearly ideal for the orbiting of satellites around the earth's poles, since the nearest land south of Point Arguello is in the frozen wastes of Antarctica. Booster rockets fired from Vandenberg cannot endanger civilians when they fall, whereas boosters fired either north or south from Cape Canaveral would pass over many inhabited areas. Other places on the California coast likewise have a clear shot southward, but Vandenberg already has facilities to support the THORS and ATLASES used as boosters.

The rockets are fired by crews of the Air Force Systems Command. Vandenberg's satellite units, the 6594th launch and 6596th instrumentation squadrons, are part of a far-flung organization which has other important installations at Sunnyvale, California, and in Alaska and Hawaii. Also participating in satellite operations are vessels of the United States Navy and the Military Sea Transportation Service. The 1st Strategic Aerospace Division supplies launchers, logistical support, and disaster protection.

Workhorse of the satellite program is the Lockheed Aircraft Corporation's AGENA, a 19 to 23 foot rocket which is carried by the booster to a great altitude and speed. As the booster rocket exhausts its fuel, explosive charges separate the two rockets and AGENA hurtles into space alone. A radio signal from the tracking station far below ignites AGENA's engine at the precise moment for its thrust to drive the entire rocket into orbit. As it sweeps around the earth at a speed of 18,000 miles an hour, infrared sensors and small stabilizing rockets keep the AGENA precisely aligned to the earth's horizon, while its radio sends back information on space

conditions. Eventually the friction of space gases slows its speed and the earth's gravity pulls it to fiery destruction in the atmosphere. But meanwhile AGENA has earned its proud title of "space vehicle".

Although AGENA space vehicles look substantially alike from the outside, the equipment inside varies so much that their weight after fuel exhaustion ranges from 1300 to 4100 pounds. This equipment hastens the day when men will make routine flights into space, by gathering information on space conditions and giving experience in the control and recovery of space vehicles.

The heavier AGENAS must be carried aloft aboard ATLAS boosters, but the weight which can be orbited by THORS has been increased to well over a ton by the use of more powerful engines in both booster and satellite. Some of the later AGENAS have been equipped for mid-orbit engine restarting. A few seconds of thrust can force a satellite into an orbit many miles deeper into space, giving it a certain amount of maneuverability as it goes about its fact-finding mission.

The THOR/AGENA Program

In many ways a satellite launching resembles a missile launch. The booster goes through a similar checkout, identical safety precautions are taken, the same human tension envelops the countdown, and the same fire and smoke awe the observer. Satellite launches bear equally fanciful nicknames—such as "Coffee Call", "Soup Spoon", "Boxing Glove", and "Power Tractor". But to the world at large, each space vehicle carried aloft by a flaming THOR from Complex 75 was a DISCOVERER. By the end of 1961 DISCOVERER XXVI was in orbit, and the end of the program is not in sight.

The story of those thirty-six launches contains all the elements of high human drama. Though the THOR boosters showed a gratifying reliability, two came to a spectacular end when they were blown up in mid-air after wandering off course. Suspense surrounded each of the remaining launches while the tracking stations studied radio signals to learn if the space vehicles had gone into orbit. Nine times the AGENA did not reach the precise velocity necessary, and either hurtled off into space or fell like a giant meteor into the Pacific. These failures were sometimes enveloped in mystery when no one could tell where the AGENA had gone or why it had failed to achieve orbit. But by far the greatest drama of the DISCOVERER program centered around the attempts to recover objects from outer space.

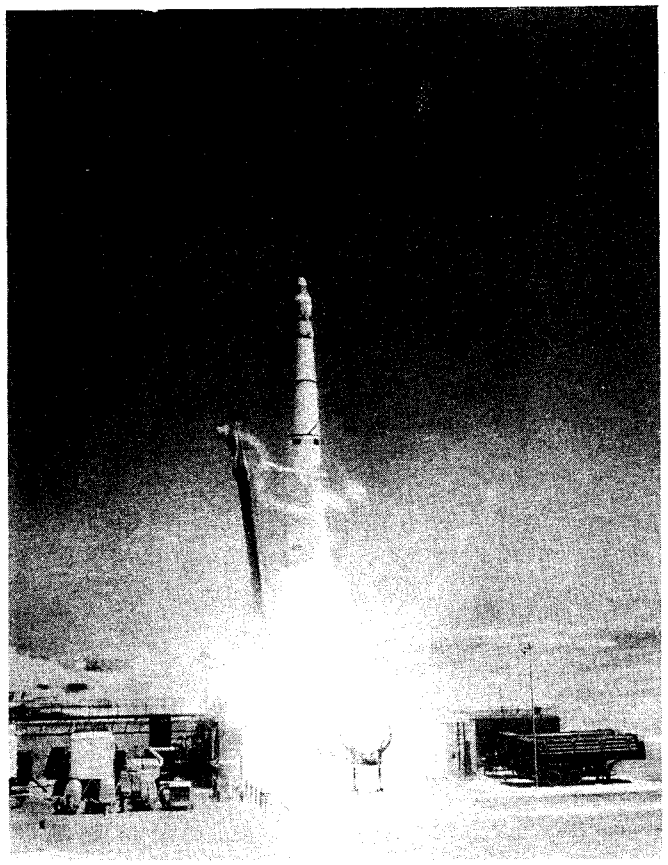
Since equipment which has been in space can furnish more information than radio messages, the bullet-shaped nose of most AGENAS from DISCOVERER II onward has been detachable. Inside this capsule (which somewhat resembles a giant kettle) is a heavy package of instruments, and extensive equipment to bring back the capsule from space. As the AGENA, oriented nose downward by its stabilizing rockets, sweeps past a tracking station in Alaska, a radio signal triggers explosive bolts and springs which hurl the capsule away from the remainder of the AGENA. Small "retro-rockets" at the capsule's base fire it downward, and the direction of its thrust gradually cancels its orbital motion. A radio beacon comes to life to mark its descent. As the capsule reenters the atmosphere northeast of Hawaii, a special heat shield protects it from incineration while the friction slows it. A large parachute opens, radar-reflecting aluminum foil is ejected, and beacon lights begin to flash. A box formation of

cargo aircraft approaches the capsule, each plane towing a trapeze-shaped snare. If the planes fail to snag the capsule in mid-air, ships attempt to recover it from the ocean.

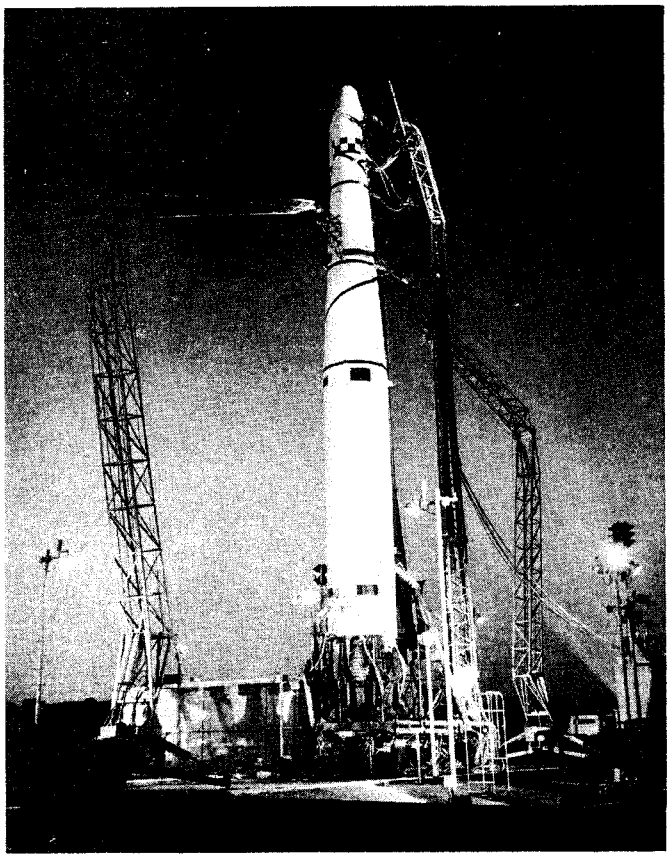
Since this capsule-recovery plan depends upon the performance of an unbroken chain of operations--each one a technical feat in itself--the early attempts were plagued with troubles. DISCOVERER II perversely ejected its capsule at the wrong time, and the first man-made object to return from space parachuted somewhere over frigid Spitzbergen. Despite a search by Norwegian and American aircraft and a cash reward offered by Lockheed, the capsule was never found. DISCOVERER VII, tumbling erratically as it sped through its orbit, failed to eject its capsule upon command. DISCOVERER XI's capsule was fired loose, but remained in orbit alongside its parent craft. The capsules of DISCOVERER V and VI simply vanished after ejection. Radio signals showed that DISCOVERER VIII's capsule came out of orbit in the right location, but it was never sighted. In an attempt to pinpoint the trouble, AFBMD launched DISCOVERER XII, a self-centered satellite filled with equipment to scrutinize the workings of its own parts. But it failed to go into orbit.

Air Mail From Space

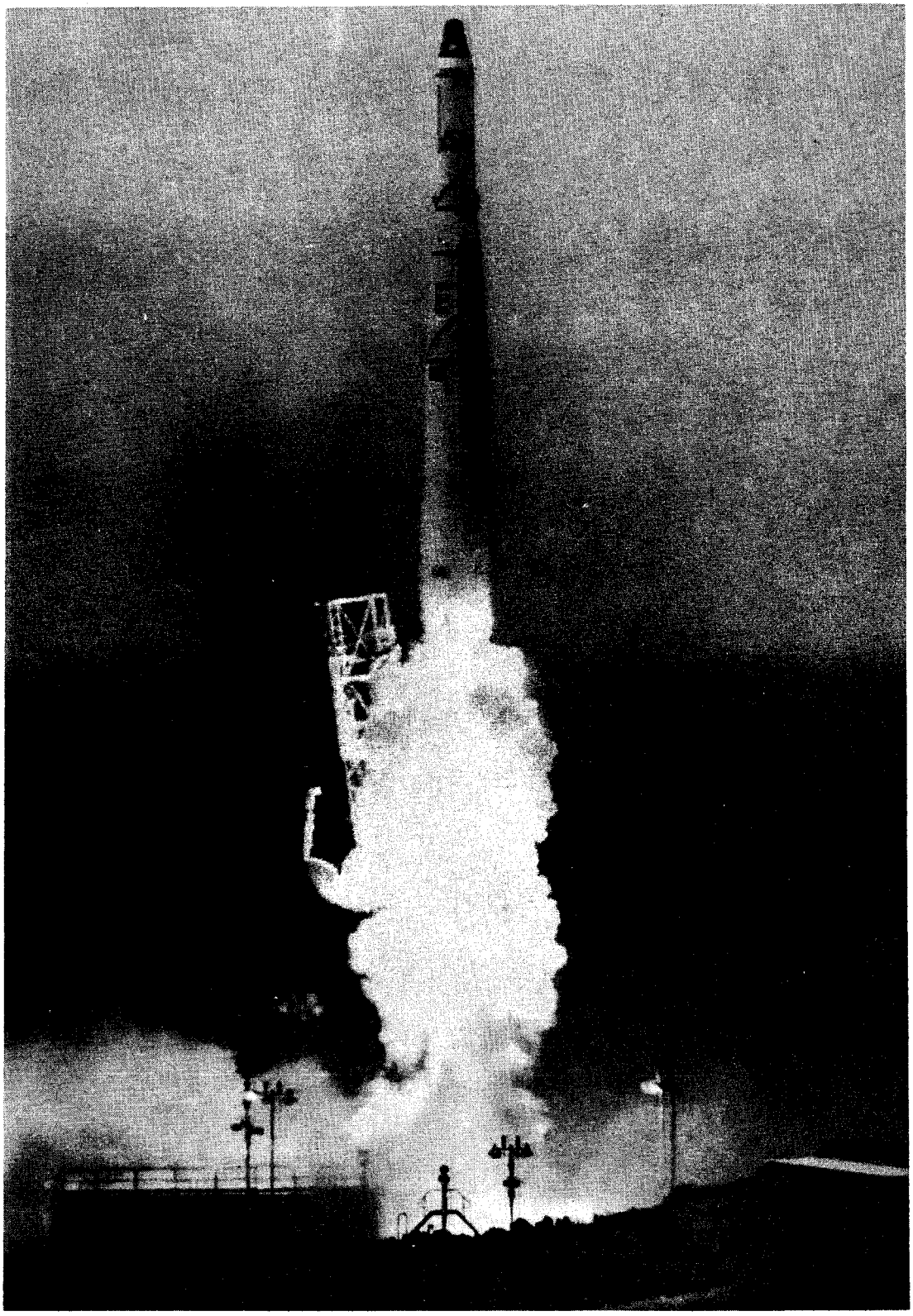
By this time some persons were estimating that the odds against capsule recovery in mid-air were 1000 to one, and the upcoming launch of DISCOVERER XIII ("Froggy Bottom") gave them an excellent chance to write of jinxes and bad luck. DISCOVERER XIII, likewise crammed with self-analyzing equipment, was launched through a heavy fog bank on August 10, 1960. It went into a 94-minute orbit whose distance above the earth varied from 161 to 436 miles. Sixteen times the AGENA swept around the earth; on the 17th, it ejected the capsule. The retro-rockets fired,



DISCOVERER V
at lift-off



DISCOVERER VIII during
launch preparations



DISCOVERER XXXV rises toward orbit, November 15, 1961

and for twelve minutes the capsule sped downward. At 50,000 feet its white and orange parachute billowed out, while the lights flashed on and aluminum foil formed a target for circling radar picket planes. As the capsule descended through towering thunder clouds, a squadron of C-119's homed in on the capsule's radio beacon and sped to intercept. They were a little too late, and found the capsule bobbing in the water. The Haiti Victory, a Pacific Missile Range ship, launched a helicopter. At 4:21 P.M. on August 11, a Navy boatswain's mate slipped into the water and secured a cable around the capsule. Soon the first object recovered from orbit was aboard ship, and within a week it was inside the White House. President Eisenhower received the silk flag carried inside the capsule, and DISCOVERER XIII's nose was soon drawing large crowds wherever it was exhibited.

The celebrations over this historic achievement were still continuing when Operation "Limber Leg" sent DISCOVERER XIV into orbit from Vandenberg. On its 17th pass over Alaska the capsule was ejected, and this time the ships and planes were nearly underneath its parachute descent. Capt. Harold E. Mitchell made a pass at it with his C-119 at 10,000 feet, missed, and tried again at 8,500 feet. A moment after he swept above the capsule Capt. Mitchell felt a gentle tug at his controls, "like hooking into a one-pound bass". The catch (which actually weighed 300 pounds) was reeled in carefully. By the time the C-119 reached Hickam Air Force Base, 200 ground crewmen and members of flight crews' families had gathered to greet it. The crew received medals on the spot, and Capt. Mitchell, navigator Robert Counts, and winch operator Louis F. Bannick were soon before television cameras in New York explaining to the nation the intricate teamwork which had made the mid-air recovery possible.

The pair of recoveries caused so great an upsurge of the program's reputation that General Ritland had to remind the public that the capsule recovery plan was still in its "research and development" phase. DISCOVERER XV quickly proved this, for its capsule came down near Christmas Island, 1,000 miles south of the planned area. It sank in heavy seas before a PMR vessel could reach the area. DISCOVERER XVI failed to separate from its THOR booster and plunged back into the atmosphere.

The program's success revived sharply when Capt. Gene M. Jones and his crew recovered the capsules of DISCOVERERS XVII and XVIII in mid-air. Both contained living matter, and were of special scientific interest because the former remained in space for thirty-one orbits during a period of intense solar radiation, while the latter circled for three days and forty-eight orbits. Lean days then returned--so lean that the next capsule to be recovered was DISCOVERER XXV's, picked up by ship on June 18, 1961, after it had eluded its aerial pursuers. The program then entered another period of success; within six months four capsules were snared in mid-air, and two more recovered from the water.

By the end of 1961 the capsule-recovery program was batting .500; twenty-two DISCOVERERS had been orbited with capsule-ejection equipment aboard, and eleven capsules had been brought back. The proportion of successes had increased so greatly since the program's early days that recoveries would apparently become fairly routine in time, just as the orbiting of DISCOVERER satellites had become routine. Since three years earlier the United States had not yet placed any satellite in orbit, and

less than eighteen months earlier no object had ever been recovered from orbit, the DISCOVERER program had certainly been strikingly successful. The information it had gathered on space conditions would greatly assist American astronauts when they ventured into orbital flights during 1962.

The ATLAS/AGENA Program

While DISCOVERER launches from Complex 75 were becoming routine, workmen had been building two ATLAS launchers on an Air Force "island" near the northern edge of the Naval Missile Facility at Point Arguello. The Arguello launchers had giant gantries and closely resembled the launchers at 576A, but they were designed specifically for satellite operations. The first launch was made on October 29, 1960, and ended in disappointment. Though the ATLAS booster performed satisfactorily, a malfunction in the AGENA kept it from going into orbit.

The second launch attempt was made on January 31, 1961. This was a murky day at Arguello; the press observers, held back at a safe distance, could not see the satellite and its booster as they peered into the drizzle. Suddenly, at 12:23 P.M., a ball of orange flame dimly outlined the 137-ton rocket as it slowly rose off the launcher. For a few seconds the muffled roar of the missile came back, and then the launcher was shrouded again in the quiet drizzle. But far overhead, the two-ton AGENA gleamed white in the sunshine as it headed towards Antarctica and orbit. Other heavy satellites were orbited from Arguello later in the year. More will undoubtedly follow, and a second pair of launchers was under construction at year's end.

NIMBUS weather satellites will be added to Vandenberg's space programs in the early 60's, and the base's suitability for other projects

is under study. The possibilities are vast. In less than two years, Vandenberg's satellites have tripled in weight, and impressive new fact-gathering techniques have been developed. These marvels of science have indeed been only the beginning of American space exploration. As man himself moves into space, Vandenberg may receive projects which seem as visionary today as 1961's space projects seemed five years ago.

A Center for Peace

Whatever the nature of future space projects, Vandenberg will also remain a bulwark of America's deterrent power.

Completion of the missile program is some distance into the future. But the missile program has already made the world safer from the horrors of nuclear war. Each group of THOR and ATLAS missile launchers represents one more target which an aggressor must instantly destroy lest he risk the devastation of his own nation. By its part in the creation of these missile units, Vandenberg has added vitally to the deterrent power already present in the Free World's widely-dispersed land and water-based bombers. And so Vandenberg stands as a bulwark of peace and freedom today, and a base for man's peaceful exploration of space tomorrow.

NOTES ON SOURCE MATERIALS

The various histories prepared for official use by the Historical Division of the Directorate of Information are the basic source of information on the operations of the 1st Strategic Aerospace Division. One series relates the story of the Division itself, from April 1957 to the present. A single volume recounts the history of the 704th Strategic Missile Wing in the second half of 1957; another volume, wing and support group activities during 1958. Monthly histories cover the wing and group during the first half of 1959. The Division histories have given very adequate coverage to subsequent missile operations, but the base support activities have unfortunately been neglected. A valuable specialized study is the "History of the Missile Safety Program at Vandenberg Air Force Base, 1957-1959". Each of these histories reproduces important letters, telegrams, and other primary source materials. Copies are on file at the Air University.

In addition to the histories, many other source materials have been useful. With few exceptions, they are restricted to official use only. They include the Strategic Air Command publication "SM-65 (ATLAS) Integrated Weapon System Training Plan", 1 June 1959; the 1st Missile Division Study "Training Plans and Programs", 12 May 1960; 1st Missile Division Manual 58-2, "Missile Safety"; the Division's evaluation reports on each of the RAF's CTL operations; launch orders; and various publications describing missiles and their supporting equipment.

Although material on base support and base development is much scarcer, a considerable quantity exists. Of great value are the reports "Economic Impact on Local Economy", prepared by the Division Comptroller in December 1959 and April 1961. A large amount of information on the family side of Vandenberg's life is contained in the base newspaper, published weekly since the summer of 1958 under the title "SAC Missileer" or "Mesa Missileer". The issues of Oct. 4, 1958, and Oct. 14, 1961, are expecially useful. The sheer number of workers is detailed in monthly "Base Population Reports".

Much information on the history of the Air Force's ballistic missile program is contained in the USAF Historical Division's restricted study "Plans and Policies for the Ballistic Missile Initial Operational Capability Program", February 1960. The concept of concurrency is lucidly detailed by Major General O. J. Ritland in the Air University Quarterly Review, XII, pp. 237-50. Volumes II and III of W. F. Craven and J. L. Cate's The Army Air Forces in World War II (Chicago, 1949-51) contain information on the 1st Bombardment Division and the V-2 program. The latter is also well described by Walter Dornberger in his memoire, V-2 (New York, 1954). F. I. Ordway and R. C. Wakeford's International Missile and Spacecraft Guide (New York, 1960), pp. 70-72, gives a useful short description of the V-2.

CHRONOLOGY OF THE 1ST STRATEGIC AEROSPACE DIVISION AND VANDENBERG AIR FORCE BASE

1941

5 October	Camp Cooke activated as an armored division training installation.

1943

13 September	1st Air (originally Bombardment) Division activated in England.

1945

31 October	1st Air Division inactivated in England.

1950

7 August	Camp Cooke reactivated to train armored and infantry troops for the Korean War.

1953

1 February	Camp Cooke inactivated towards the close of the Korean War.

1956

1 September	Secretary of the Air Force, Donald Quarles, approved the location of the ICBM/IRBM operational training site at Camp Cooke, California.

1957

18 March	The 1st Air Division was redesignated the 1st Missile Division, and the 392d Base Headquarters and Air Base Squadron was redesignated and reconstituted as the 392d Air Base Group.
15 April	The 1st Missile Division and the 392d Air Base Group were activated. Colonel William A. Sheppard was named the first commander of the Division.
7 June	The Air Force portion of Camp Cooke was renamed Cooke Air Force Base.
1 July	The 704th Strategic Missile Wing (ICBM-Atlas) was activated at the base.

16 July	Headquarters, 1st Missile Division changed its operational location from Inglewood, California to Cooke.
1 August	The 1st Missile Division assumed operational control of the 704th Strategic Missile Wing.
15 September	The 392d Missile Training Squadron was activated at Cooke.
23 October	Ground was broken for the first increment of 880 Capehart family housing units on base.

1958

1 January	Headquarters, 1st Missile Division, its subordinate commands, and the base were transferred from ARDC to SAC.
2 January	Major General David Wade assumed command of the 1st Missile Division.
1 February	The 704th Instrumentation Squadron was activated at the base.
28 February	The Secretary of Defense directed the Air Force to assume all research and development responsibilities for all land-based IRBM's and ICBM's.
1 April	The 576th Strategic Missile Squadron (ICBM-Atlas) was activated at the base.
1 May	The 4315th Student Squadron designated and organized.
8 May	The first missile, a non-operational Atlas, was delivered to the base.
12 May	The first Air Force family moved into the Capehart family housing development.
25 July	The 51st Aviation Depot Squadron activated. A contract was awarded the same day on the second group of Atlas launchers.
31 July	Construction began on the prototype Titan facility, an Operational System Test Facility, at the base.

5 August	The first Royal Air Force students arrived to begin Thor integrated weapon system training.
13 August	The first operational Thor IRBM was delivered to the base.
20 August	The first Thor IWST class begins.
1 September	The 866th Strategic Missile Squadron (IRBM-Jupiter) was activated at Redstone Arsenal to train crews for the Jupiter IRBM.
19 September	The first Thor class completed IWST.
4 October	Cooke renamed Vandenberg Air Force Base in honor of the late General Hoyt S. Vandenberg.
8 December	The first 25 ton/day liquid oxygen (LOX) and nitrogen generator plant became operational.
15 December	The first Thor missile was launched from Vandenberg Air Force Base.

1959

15 January	The 703rd and 706th Strategic Missile Wings were transferred from the 1st Missile Division to the 15th Air Force. The first Atlas complex, 576-A, turned over to SAC after completion of basic construction; installation and checkout of ground support equipment commenced.
1 February	The 395th Strategic Missile Squadron (ICBM-Titan) activated at Vandenberg Air Force Base.
28 February	DISCOVERER I, the first polar-orbiting artificial earth satellite, was launched from Vandenberg Air Force Base.
2 March	The first formal equipment-oriented IWST class began for Thor students.
9 April	A Thor IRBM exploded on its stand during a static firing test at Vandenberg.
16 April	An RAF crew launched their first Thor IRBM down the Pacific Missile Range.

June	Construction began on Titan Training Facility #1, later redesignated as Complex 395-A.
23 July	Construction began on Atlas Complex 576-C.
7 August	Basic construction was completed on Atlas Complex 576-B; installation and checkout began.
22 August	First static firing of an Atlas accomplished at Complex 576-A at Vandenberg.
1 September	Complex 576-A was formally accepted by the 1st Missile Division.
9 September	The first Atlas ICBM was successfully launched from Vandenberg Air Force Base by a SAC crew.
22 September	Agreement for coordinated peacetime operation of the Pacific Missile Range was signed by Vice Chief of Staff, General Curtis LeMay, and Admiral Arleigh Burke, Chief of Naval Operations. The agreement expanded the role of the Navy in the area of missile safety and satellites launched from Vandenberg/Point Arguello Area.
23 September	The Department of Defense announced that the Air Force would be given major responsibility for development, production and launching of military space boosters. Several projects were transferred to the Air Force. Vandenberg/ Point Arguello was to be the scene of a number of these launchings.
4 November	Construction began on an Atlas silo launcher. General Wade announced the Atlas at Vandenberg had been integrated into the SAC emergency war plan (EWP).

1960

1 January	The 866th Strategic Missile Squadron (IRBM-Jupiter) was redesignated the 866th Technical Training Squadron.
21 January	An eleventh RAF Thor was launched from Vandenberg, marking the end of the formal IWST program.

3 February	Atlas "D" training started for crews from the 564th Strategic Missile Squadron, Warren Air Force Base, Wyoming.
17 February	The initial two-week Atlas Missile Maintenance Management class began.
7 April	The first Titan arrived at Vandenberg AFB.
22 April	The first launch from Atlas Complex 576-B was conducted.
23 April	Three "Launch Control Trainers" (T25, T26 and T27) arrived at Vandenberg AFB for familiarization and operating procedures of the Crew Procedures Laboratory.
1 June	Pacific Missile Range took charge of missile flight safety system in the Vandenberg/Point Arguello area.
1 July	The 394th Missile (Training) Squadron (ICBM-Minuteman), was activated.
26 July	Major repairs were completed at Complex 576-A, Emplacement #1, damaged in the 5 March Atlas explosion.
11 August	After the Air Force failed to snare the capsule from DISCOVERER XIII, a Navy frogman recovered it from the sea. This was the first Discoverer capsule to be recovered.
19 August	DISCOVERER XIV's data capsule was successfully air snatched by the 6594th Recovery Squadron as it returned from space---the first operation of its kind.
2 October	The first "open house" observance at Vandenberg brought 125,000 visitors to the base.
1 December	Basic construction was completed on the first Atlas silo launcher at Vandenberg.
3 December	A Titan missile exploded while being lowered into a silo at Vandenberg.

20 December	The 704th Instrumentation Squadron was deactivated at Vandenberg.

1961

21 January	The Division formally accepted a T-600 Trainer for the Atlas "E" program at Vandenberg.
30 January	The first Atlas "E" series academic and missile procedures training got underway.
2 February	Groundbreaking cermonies were held to mark the beginning of Minuteman construction at Vandenberg.
24 February	The third increment of Capehart Housing at Vandenberg became ready for occupancy during the week of 24 February.
10 March	The first Atlas "E" launch crew personnel from the 576th Strategic Missile Squadron graduated after completing 100 percent of their Phase I Operational Readiness Training (ORT).
14-16 April	The Division moved into a new headquarters building. The following week the 392d Combat Support Group occupied its newly completed headquarters.
3 May	The first Titan in-silo launch was successfully completed at the silo launch test facility, Vandenberg AFB.
19 May	The Atlas "D" ORT program was completed with graduation Class #10 from the 566th Strategic Missile Squadron.
7 June	An Atlas "E" missile exploded during the first attempt to launch an "E" missile from Vandenberg.
14 June	The 3901st Strategic Standardization Squadron (Later renamed the 3901st Strategic Missile Evaluation Squadron), was activated at Vandenberg to standardize operational procedures at all ICBM bases.
21 June	The first Atlas "F" missile arrived at Vandenberg Air Force Base.
1 July	Major General Joseph J. Preston replaced Major General David Wade as Commander, 1st Missile Division.

21 July	Headquarters, 1st Missile Division became Headquarters, 1st Strategic Aerospace Division. The 392d Combat Support Group was simultaneously redesignated as the 4392d Aerospace Support Wing.
25 August	Government officials dedicated the 50,000th Capehart house at Vandenberg. The house stands at 1119 Timberlane.
23 September	The first launch from Vandenberg's Titan silo-lift facilities was carried out.
18 October	The 392d Strategic Missile Wing activated at Vandenberg AFB.
1 November	The first Minuteman ICBM to be delivered to Vandenberg, an inert training missile, arrived.
20 December	The 392d Strategic Missile Wing discontinued; 4392d Aerospace Support Wing redesignated 4392d Aerospace Support Group.

THOR LAUNCHES

NAME	DATE	CREW
Tune Up	16 Dec 58	SAC Crew
Lions Roar	16 Apr 59	RAF Crew
Rifle Shot	16 Jun 59	RAF Crdw
Bean Ball	3 Aug 59	RAF Crew
Short Skip	14 Aug 59	RAF Crew
Grease Gun	17 Sep 59	RAF Crew
Foreign Travel	6 Oct 59	RAF Crew
Stand Fast	21 Oct 59	RAF Crew
Beach Buggy	12 Nov 59	RAF Crew
Hard Right	1 Dec 59	RAF Crew
Tall Girl	14 Dec 59	RAF Crew
Red Caboose	21 Jan 60	RAF Crew
Center Board	2 Mar 60	RAF Crew
Clan Chattan	22 Jun 60	RAF Crew
Left Rudder	11 Oct 60	RAF Crew
Acton Town	13 Dec 60	RAF Crew
Shepherds Bush	29 Mar 61	RAF Crew
White Bishop	20 Jun 61	RAF Crew
Skye Boat	6 Sep 61	RAF Crew
Pipers Delight	5 Dec 61	RAF Crew

ATLAS LAUNCHES

Desert Heat	9 Sep 59	SAC Crew
Dual Exhaust	26 Jan 60	SAC Crew
Quick Start	22 Apr 60	SAC Crew
Lucky Dragon	6 May 60	SAC Crew
Tiger Skin	22 Jul 60	SAC Crew
Golden Journey	12 Sep 60	SAC Crew
High Arrow	29 Sep 60	SAC Crew
Diamond Jubilee	12 Oct 60	SAC Crew
Hot Shot	16 Dec 60	SAC Crew
Little Satin	24 May 61	SAC Crew
Sure Shot	7 Jun 61	AFSC Crew
New Nickel	22 Aug 61	SAC Crew
Big Push	29 Nov 61	SAC Crew
Big Chief	7 Dec 61	SAC Crew

TITAN LAUNCHES

Silver Saddle	3 May 61	AFSC Crew
Big Sam	23 Sep 61	AFSC Launch(SAC Crew)

DISCOVERER LAUNCHES

I	Flying Yankee	28 Feb 59	Successful orbit no recovery attempt
II	Early Time	13 Apr 59	Successful orbit, no recovery
III	Gold Duke	3 Jun 59	Successful launch, no orbit
IV	Long Road	25 Jun 59	Successful launch, no orbit
V	Fly High	13 Aug 59	Successful orbit, no recovery
VI	Hurry Up	19 Aug 59	Successful orbit, no recovery
VII	Cargo Net	7 Nov 59	Successful orbit, no recovery
VIII	Livid Lady	20 Nov 59	Successful orbit, no recovery
IX	Hungry Eye	4 Feb 60	Successful launch, no orbit
X	Derby Day	19 Feb 60	Destroyed in Flight
XI	Rams Horn	15 Apr 60	Successful orbit, no recovery
XII	Red Garter	29 Jun 60	Successful launch, no orbit
XIII	Froggy Bottom	10 Aug 60	Successful orbit, recovery
XIV	Limber Leg	18 Aug 60	Successful orbit, air catch (1st)
XV	Coffee Call	13 Sep 60	Successful orbit, no recovery
XVI	Soup Spoon	26 Oct 60	Successful launch, no orbit
XVII	Boxing Glove	12 Nov 60	Successful orbit, air catch (2nd)
XVIII	Power Tractor	7 Dec 60	Successful orbit, air catch (3rd)
XIX	Tee Bird	20 Dec 60	Successful orbit, no recovery attempt
XX	Spirit Level	17 Feb 61	Successful orbit, no recovery
XXI	Bench Warrant	18 Feb 61	Successful orbit, no recovery attempt
XXII	Feather Cut	30 Mar 61	Successful launch, no orbit
XXIII	Running Board	8 Apr 61	Successful orbit, no recovery

XXIV	Island Queen	8 Jun 61	Successful launch, no orbit
XXV	Marked Card	16 Jun 61	Successful orbit, AF water pick-up
XXVI	High Wing	7 Jul 61	Successful orbit, air catch (4th)
XXVII	Stacked Deck	21 Jul 61	Destroyed in flight
XXVIII	Crisp Bacon	4 Aug 61	Successful launch, no orbit
XXIX	Full Blower	30 Aug 61	Successful orbit, water recovery
XXX	Twisted Braids	12 Sep 61	Successful orbit, air catch (5th)
XXXI	Cane Pole	17 Sep 61	Successful orbit, no recovery
XXXII	Cap Pistol	13 Oct 61	Successful orbit, air catch (6th)
XXXIII	Dead Heat	23 Oct 61	Successful launch, no orbit
XXXIV	Fog Cutter	5 Nov 61	Successful orbit, no recovery
XXXV	Cat Fight	15 Nov 61	Successful orbit, air catch (7th)
XXXVI	Silver Strip	12 Dec 61	Successful orbit, water recovery

ATLAS/AGENA Launches from Pt. Arguello

Gibson Girl	11 Oct 60	Failed to orbit
Jayhawk Jamboree	31 Jan 61	Successful orbit
Polar Orbit	12 Jul 61	Successful orbit
First Motion	9 Sep 61	On-pad explosion
Big Town	21 Oct 61	Successful orbit
Round Trip	22 Nov 61	
Ocean Way	22 Dec 61	